

PROTECTED AREAS AND CLIMATE CHANGE

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Abstract: The main aim of this contribution is to provide information about the potential sensitivity of existing flora, of two botanical reserves in Transylvania (Suatu I & II and Cheile Turzii), located in the Continental and Alpine bio-geographical regions of Romania, in thermophilic and xerophyllous zones. More specifically, the work was focus on the sensitivity assessment to predicted changes in air temperature and edaphic humidity, for a representative number of vascular plants (607 taxa – Cheile Turzii; 173 taxa – Suatu), collected from the literature, for each area. Special attention was addressed to existing protected taxa. The assessment was based on the requirements of the plants in terms of humidity and heat. Our results underline that: i) the plants from the two protected areas are less sensitive to the predicted effects of the selected parameters, ii) the protected taxa from Suatu are potentially not sensitive to the predicted changes in temperature and precipitations, iii) the protected taxa from Cheile Turzii are 10% sensitive, and iv) many of the existing trees can be considered sensitive, especially to the decrease in precipitation. Information about the vascular plants from Suatu and Cheile Turzii that can be considered resistant to climatic changes in the medium term, are also included. The data from this analysis are not sufficient to predict the future of the two protected areas, but they offer information on the effects of climate change and potential threats.

Keywords: climate challenges, Natura 2000 sites, flora sensitivity, Transylvania area

Introduction

In Central and Eastern Europe the mean annual temperature is projected to increase significantly up to the end of this century and the precipitation to decrease and to shift from summer to winter. According to existing information, it is predicted that many protected areas across Europe are to be affected by this global threat of climate change. Climate change will impact the habitat conditions and, depending on the species sensitivity, will affect to a greater or lesser extent species composition in protected areas and elsewhere.

This paper addresses protected areas in Transylvania, Romania, and aims to provide information on the potential sensitivity of the cormophyte flora against climate change projections for near future.

What climate change can we expect in this century?

The 4th Report of the Intergovernmental Panel on Climate Change [12] predicts a global temperature rise (annual average 1.1–6.4°C) and significant variations in rainfall, associated with floods and drought. The impacts of climate change already observed are projected to continue due to future climate change. The European Environment Agency (EEA) Report on Climate Change, from 2012 [10], warns about a potential decrease in plant diversity and changes to the structure and functions of ecosystems. Some studies anticipate a significant reduction (more than 50%) of plant and animal diversity in protected areas of Europe by the end of this century, because these will no longer have suitable climatic conditions in which to survive [2].

Which pressures, effects and threats can be expected?

The increase in temperature, decrease in rainfall, seasonal changes in precipitation and temperature and the increase of extreme weather phenomena are important climate change pressures in our time.

Their effects such as mild winters, reduced snowfall, warm springs, warm and dry summers, low precipitation, significant variation in temperature and precipitation over the year, high differences in temperature (10–15°C) between day and night, heavy rains, storms, hails and the late frosts, threats the life cycles of plants, affecting their self-regulation capacity.

There are few ways in which plants may respond to climate change effects: they can persist in the modified environmental conditions, migrate to more suitable areas or become extinct [27]. In this respect, loss of plant species from high altitudes, dependent on low temperatures, humidity and snow, can be expected.

An overview of the impacts and threats of climate change already observed [10], has underlined that the long-term value of many Natura 2000 sites will be affected and many plants with restrictive climatic requirements and low capacity to adapt may face extinction [25].

For this contribution two protected areas from Transylvania were considered and two questions to be answered were selected:

How sensitive are the vascular plants living there, to climate change effects?

How vulnerable are the two protected areas to climate change impact?

Material and Methods

Two protected areas from Transylvania were taken into consideration in this paper:

Natura 2000 site: Suatu-Cojocna-Crairât (area: 4,146 ha), located in the Continental biogeographical region, at an altitude between 307 m and 622 m. Special attention was addressed to Suatu I & II botanical reserves (altitude: 430 m, area: 10 ha), which host the Natura 2000 habitat type 6240* - Sub-Pannonic steppic grasslands, a priority habitat for conservation [29] in Europe (Photo 1).

Natura 2000 site: Cheile Turzii (area: 326 ha), located in the Alpine and Continental biogeographical regions, at an altitude between 422 m and 636 m (Photo 2). This area hosts twelve Natura 2000 habitat types, half of them of priority for conservation in Europe [29].

6110* - Rupicolous calcareous or basophilic grasslands of the *Alyso-Sedion albi*

6190 - Rupicolous pannonic grasslands (*Stipo-Festucetalia pallentis*)

6240* - Sub-pannonic steppic grasslands

6430 - Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

6210* - Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometea*)

9130 - *Asperulo-Fagetum* beech forests

91E0* - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

8120 - Calcareous and calcashist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)

9110 - *Luzulo-Fagetum* beech forests

8210 - Calcareous rocky slopes with chasmophytic vegetation

8160* - Medio-European calcareous scree of hill and montane levels

9180* - *Tilio-Acerion* forests of slopes, screes and ravines

The following parameters were evaluated for both selected areas from Transylvania: species richness, types of taxa, zoological categories and ecological categories of plants reflecting their preferences with regard to moisture and temperature.



Photo 1: Sub-Pannonic steppic grasslands in Suatu botanical reserve, Nature 2000 site Suatu-Cojocna-Crairât
(Foto: Șuteu Alexandra)

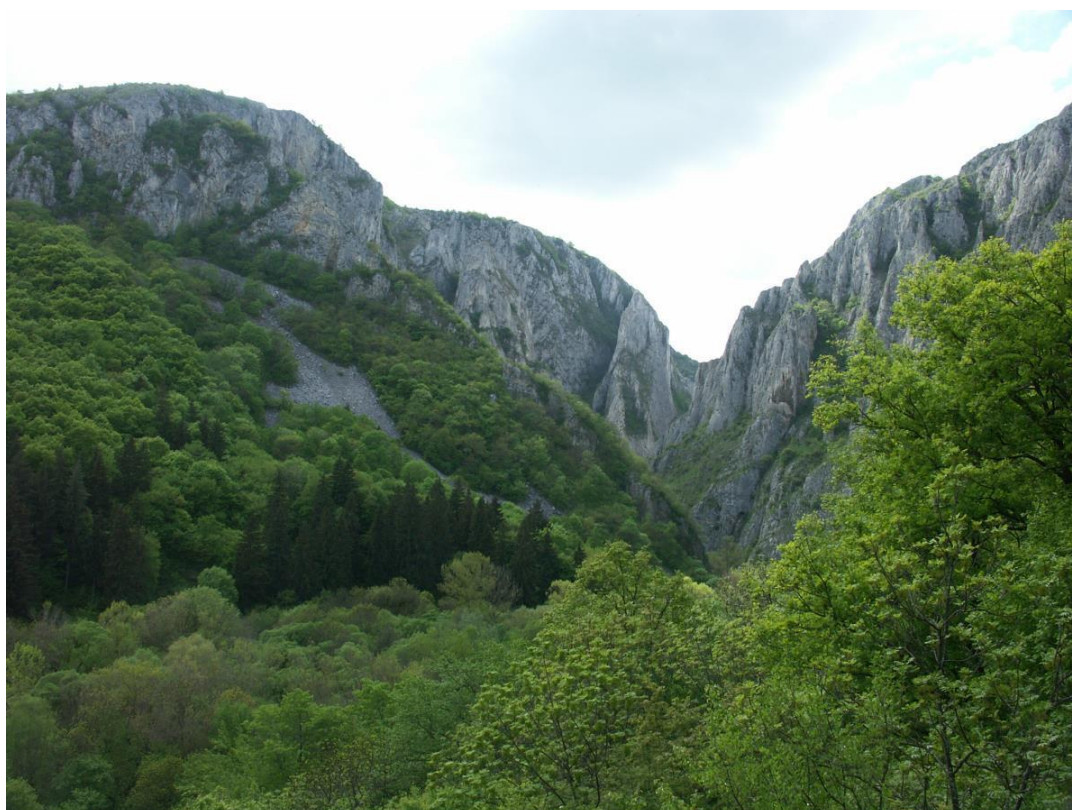


Photo 2: Natura 2000 site Cheile Turzii (Foto: Anca Sârbu)

The data relating to species richness [3, 6, 16, 18, 19, 20, 21, 26] and types of habitats [8, 11, 14, 29] were obtained from the Romanian literature. In this regard were considered 607 taxa (60% of all species nominated for this protected area) for Natura 2000 site Cheile Turzii and 173 taxa (97% of all species) for Suatu I & II botanical reserves. The plant taxa types (tree, shrub, sub-shrub, herbaceous plant) were identified in accordance with the Romanian Flora [21] and nomenclature is in accordance with Vascular Plants in Romania [26].

Identification of plants with conservation value was achieved by consulting national reference documents, such as the national Red List of Higher Plants from Romania [15], Red Book of Vascular Plants from Romania [7] and international documents as the IUCN Red List 2011 and Annex II of the EU Habitats Directive [5].

The assessment of the potential sensitivity of plants to climate change was based on the evaluation of their preferences in terms of edaphic humidity and air temperature. The scales for moisture and heat utilized in determining the ecology of species in Romania [3, 17] were used.

Results

Suatu botanical reserve. The two plots comprising the botanical reserve of Suatu are situated on sunny slopes, where steppe vegetation has developed under climate characterized by average annual temperatures of 8–9° C and rainfall of c. 600 mm/year. Plot I preserves a population of the endemic plant *Astragalus peterfii* Jáv., and plot II a population of *Ephedra distachya* L. ssp. *monostachya* (L.) Riedl, a postglacial xerothermic relict, located at the northern zone of its Transylvanian area of distribution.

One of the xerothermic plant communities from Suatu, belongs to Natura 2000 habitat type 6240* - sub-Pannonic steppic grasslands. The trees (2%) and shrubs (4%) have a small weight in the taxonomic structure of these xerophilous grasslands (Fig. 1). The analyses of the plants preferences, from humidity and temperature point of view, underline:

- ✓ 89% of plant taxa present are potentially resistant to reducing edaphic moisture (mesoxerophyte, xero-mesophyte, xerophyte, euriphyte), 9% are mesophytes and only 2% can be considered sensitive taxa (hygrophyte, mesohygrophyte, mesophyte-mesohygrophyte), dependent on moisture (Fig. 2, Fig. 3);
- ✓ 75% of taxa present are potentially tolerant to an increase of air temperature (mesothermophyte-subthermophyte, subthermophyte, thermophyte, euriphyte), 22% are mesothermophytes and only 3% are microthermic dependent (microthermophyte, microthermophyte-mesothermophyte) (Fig. 4, Fig. 5).

Only 4 taxa can be considered sensitive to moisture decrease: *Cuscuta europaea* L. - mesohygrophyte, *Festuca pratensis* Huds. - meso-mesohygrophyte, *Phragmites australis* (Cav.) Trin. ex Steud. – hydrophyte and *Ulmus glabra* Huds. - mesohygrophyte. A total of 5 taxa can be considered sensitive to temperature increase: *Arenaria serpyllifolia* L. - micro-mesothermophyte, *Cruciata glabra* (L.) Ehrend. - microthermophyte, *Festuca pratensis* Huds. - microthermophyte, *Galium verum* L. - micro-mesothermophyte, *Trifolium montanum* L. - microthermophyte. Only one taxon, *Festuca pratensis* Huds. (meso- mesohygrophyte and microthermophyte) is sensitive to both parameters (temperature increase and moisture decrease).

The 15 taxa with conservation value from Suatu botanical reserve can be considered as potentially tolerant to the predicted increase in temperature and humidity decrease. Important species for conservation (EU Habitats Directive Annexes) such as *Astragalus peterfii* Jáv., *Crambe tataria* Sebeók and *Echium maculatum* L. (*E. rossicum* J.F. Gmel.) and *Salvia transsylvanica* (Schur ex Griseb. et Schenk) Schur (Photo 3) are potentially resistant (xeromesophyte, subthermophyte) to the predicted change in temperature and humidity (Table 1).

Of the 10 species of trees and shrubs, just one (*Ulmus glabra* Huds.) is sensitive to moisture reduction.

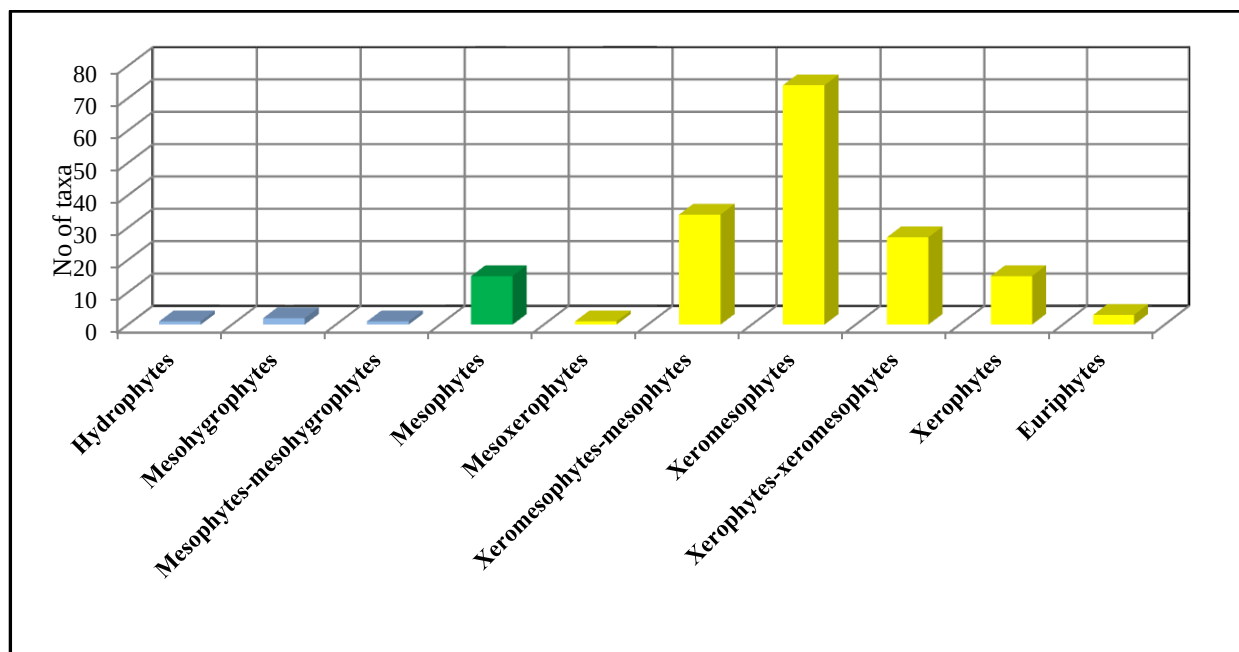


Fig. 2: Suatu – Natura 2000 habitat type 6240* - sub-Pannonic steppic grasslands. Humidity: composition in ecological categories (hydrophytes, mesohydrophytes, mesophytes-mesohydrophytes, mesophytes, mesoxerophytes, xeromesophytes-mesophytes, xeromesophytes, xerophytes-xeromesophytes, xerophytes, euriphytes), of a sample of 173 vascular plants

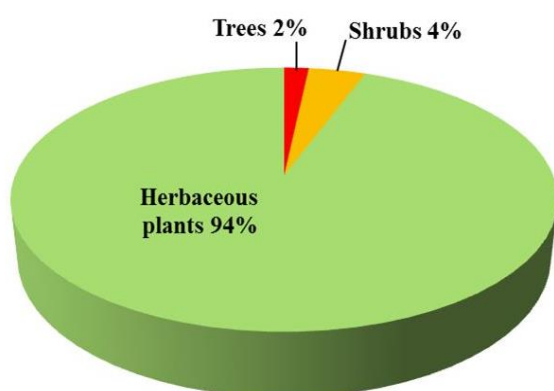


Fig. 1: Percentage of trees, shrubs and herbaceous taxa in Suatu – Natura 2000 habitat type 6240* - sub-Pannonic steppic grasslands (sample of 173 vascular plants)

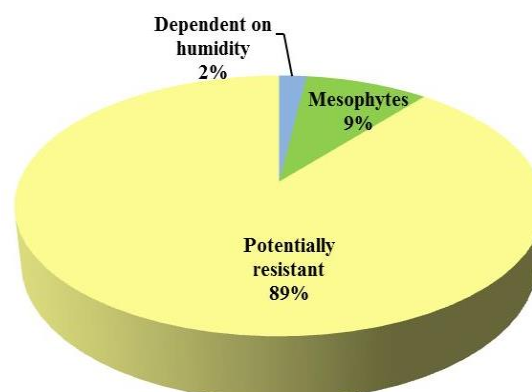


Fig. 3: Suatu – Natura 2000 habitat type 6240* - sub-Pannonic steppic grasslands, percentage of plants sensitive (dependent on humidity) and potentially resistant to moisture decrease (sample of 173 vascular plants)

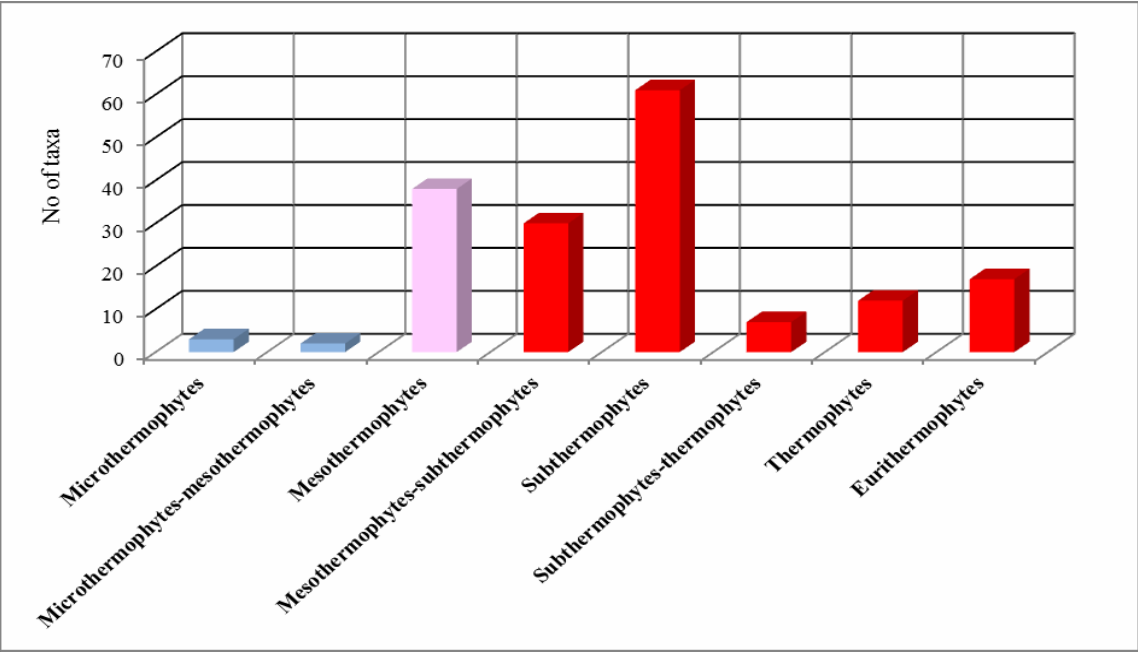


Fig. 4: Suatu – Natura 2000 habitat type 6240*- sub-Pannonic steppic grasslands. Air temperature: composition in ecological categories (microthermophytes, microthermophytes-mesothermophytes, mesothermophytes, mesothermophytes-subthermophytes, subthermophytes, subthermophytes-thermophytes, thermophytes, eurithermophytes), of a sample of 173 vascular plants



Photo 3: *Salvia transsylvanica* (xero - xeromesophyte and meso-subthermophyte), Suatu botanic reserve, Natura 2000 habitat type 6240* - sub-Pannonic steppic grasslands (Foto: Anca Sârbu)

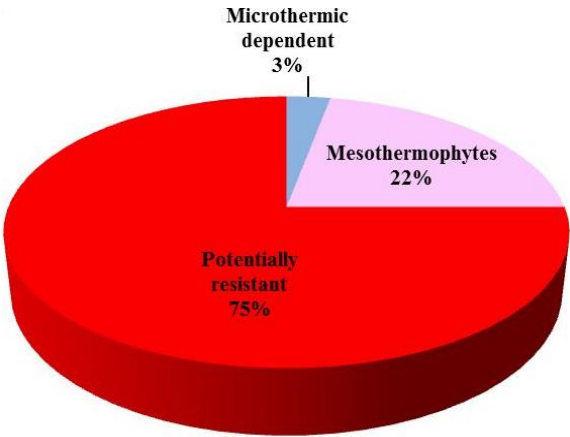


Fig. 5: Suatu – Natura 2000 habitat type 6240*-sub-Pannonic steppic grasslands, percentage of plants sensitive (microthermic dependent) and potentially resistant to temperature increase (sample of 173 vascular plants)

Table 1: Suatu botanic reserve - Plants with conservative value and their ecological preferences in terms of humidity and temperature

Taxa	Sozological categories (<i>Romanian Red List, Habitats Directive</i>)	Humidity (ecological categories)	Temperature (ecological categories)
<i>Astragalus peterfii</i> Jáv.	Endangered/Rare Habitats Directive	xero-xeromesophyte	subthermophyte
<i>Astragalus dasyanthus</i> Pall.	Rare	xeromesophyte	meso-subthermophyte
<i>Centaurea trinervia</i> Willd.	Rare	xero-xeromesophyte	subthermophyte
<i>Cephalaria radiata</i> Griseb. et Schenk	Endemic Rare	xeromesophyte	subthermophyte
<i>Cirsium furiens</i> Griseb. et Schenk	Not threatened	xeromeso-xeromesophyte	mesotermophyte
<i>Crambe tataria</i> Sebeók	Vulnerable/Rare Habitats Directive	xeromesophyte	subthermophyte
<i>Dictamnus albus</i> L.	Vulnerable/Rare	xero-xeromesophyte	subthermo-thermophyte
<i>Echium maculatum</i> L. (<i>E. rossicum</i> J.F. Gmel.)	Habitats Directive	xeromesophyte	subthermophyte
<i>Ephedra distachya</i> L. ssp. <i>monostachya</i> (L.) Riedl	Postglacial relict xerothermal Rare	xeromesophyte	subthermo-thermophyte
<i>Iris pontica</i> Zapał.	Vulnerable/Rare	xeromeso-mesophyte	subthermophyte
<i>Jurinea mollis</i> (L.) Rchb. ssp. <i>transylvanica</i> (Spreng.) Nyman	Subendemic Rare	xeromesophyte	meso-subthermophyte
<i>Nepeta ucranica</i> L.	Vulnerable/Rare	xero-xeromesophyte	subthermophyte
<i>Onosma arenaria</i> Waldst. et Kit. ssp. <i>pseudarenaria</i> (Schur) Jáv. (<i>O. pseudarenaria</i> Schur)	Rare	xero-xeromesophyte	meso-subthermophyte
<i>Prunus tenella</i> Batsch	Vulnerable	xeromesophyte	subthermophyte
<i>Salvia transsylvanica</i> (Schur ex Griseb. et Schenk) Schur	Endemic Rare	xero-xeromesophyte	meso-subthermophyte

Cheile Turzii. Cheile Turzii Natura 2000 site accommodates a remarkable floristic richness (over 1000 species and subspecies of plants) and a diversity of habitat types, of which many are priorities for conservation in Europe [4, 16, 20, 22]. The highest taxonomic diversity characterized the herbaceous plants group (Fig. 6).

Analysing the preferences of plants present in this protected area (sample of 607 vascular taxa) to humidity and temperature, the following aspects can be underlined:

- ✓ 60% of plant taxa analysed can be considered potentially resistant to the reduction of the edaphic humidity, 24% are mesophyte and 16% are sensitive taxa, dependent on moisture (Fig. 7, Fig. 8);
- ✓ 46% of the plants included in this study can be considered to be tolerant to the increase of air temperature, 42% are mesothermophytes and 12% are sensitive plants, dependent on the presence of lowered temperature (Fig. 9, Fig. 10).

Of the 607 vascular plants included in this evaluation, only 16 plants are potentially sensitive to both moisture decrease and temperature increase: *Aconitum variegatum* L. - mesohygrophite, micro-mesothermophyte; *Ajuga reptans* L. - meso-mesohygrophite, micro-mesothermophyte; *Alnus incana* (L.) Moench. - mesohygrophite, microthermophyte; *Anthemis macrantha* Heuff. - meso-mesohygrophite, microthermophyte; *Caltha palustris* L. - hygrophite, microthermophyte; *Chenopodium bonus-henricus* L. - meso-mesohygrophite, microthermophyte; *Chrysosplenium alternifolium* L. - mesohygrophite, microthermophyte; *Doronicum austriacum* Jacq. - meso-mesohygrophite, microthermophyte; *Doronicum columnae* Ten. - meso-mesohygrophite, microthermophyte; *Festuca pratensis* Huds. - meso- mesohygrophite, microthermophyte; *Filipendula ulmaria* (L.) Maxim. - mesohygrophite, microthermophyte; *Hesperis matronalis* L. - mesohygrophite, microthermophyte; *Lysimachia vulgaris* L. - hygrophite, microthermophyte; *Lythrum salicaria* L. - mesohygrophite, micro- mesothermophyte; *Moehringia muscosa* L. - mesohygrophite, microthermophyte; *Silene latifolia* Poir. ssp. *alba* (Mill.) Greuter et Burdet - meso-mesohygrophite, microthermophyte.

Most of the plants with conservation value are potentially tolerant of climate change (Photo 4), since only a few (5 taxa) are potentially sensitive:

- *Anthemis macrantha* Heuff. (Rare plant) - mesophyte-mesohygrophite, microthermophyte;
- *Scabiosa lucida* Vill. ssp. *barbata* Nyâr. (Rare plant) - xeromesophyte-mesophyte, microthermophyte;
- *Waldsteinia geoides* Willd. (Rare plant) - mesophyte, microthermophyte-mesothermophyte;
- *Taxus baccata* L. (Vulnerable/Rare plant) - mesophyte, mesothermophyte-subthermophyte;
- *Galanthus nivalis* L. (Habitats Directive) - mesophyte-mesohygrophite, mesothermophyte.

In terms of trees, shrubs and sub-shrubs, our results shows that 60% of the trees and 40% of the shrubs and sub-shrubs are sensitive to predicted climate change in temperature and/or moisture (Table 2).

Especially the hydrophyte trees such as *Alnus glutinosa* (L.) Gaertn., *Salix alba* L., *Salix fragilis* L., the mesohygrophite-hygrophite shrubs such as *Rubus caesius* L. and *Viburnum opulus* L., the microthermophyte trees such as *Alnus incana* (L.) Moench. and shrubs such as *Sorbus aucuparia* L., *Viburnum lantana* L. may be especially threatened in the near future.

On the other hand, xerothermophyte and mesothermophyte shrubs such as *Sorbus torminalis* (L.) Crantz and *Staphylea pinnata* L. can be considered as species resistant to climate change effects.

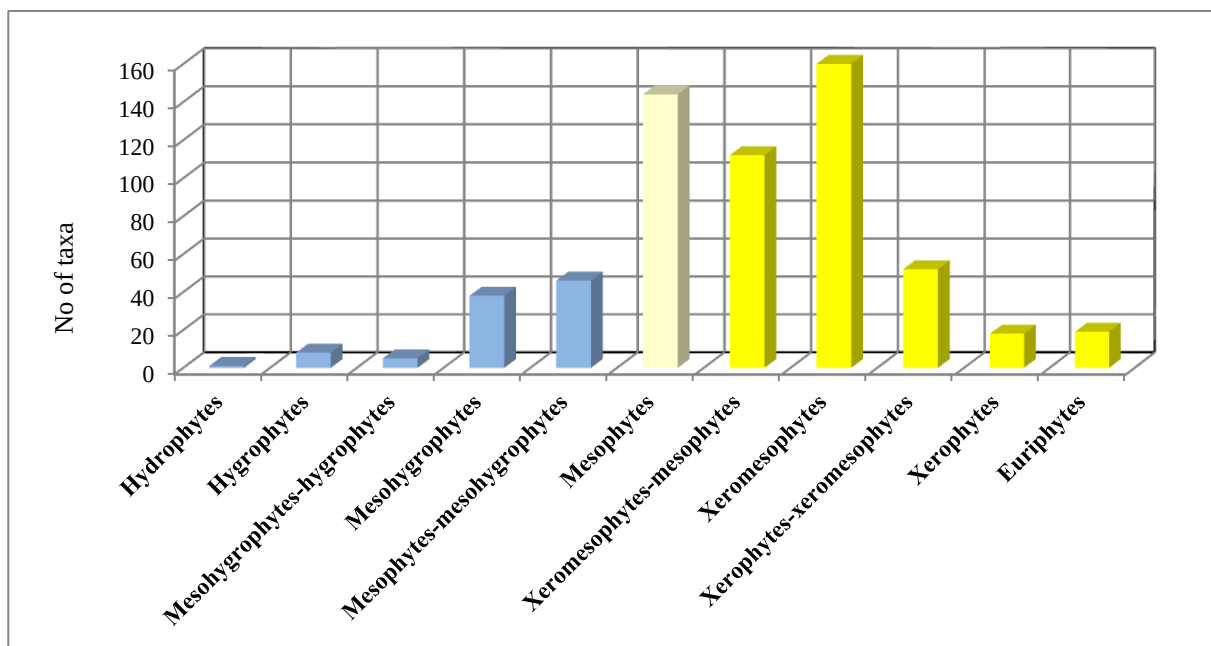


Fig. 7: Natura 2000 site Cheile Turzii. Humidity: composition in ecological categories (hydrophytes, hygrophytes, mesohygrophytes-hygrophytes, mesohygrophytes, mesophytes-mesohygrophytes, mesophytes, xeromesophytes-mesophytes, xeromesophytes, xerophytes-xeromesophytes, xerophytes, euriphytes), of a sample of 607 vascular plants

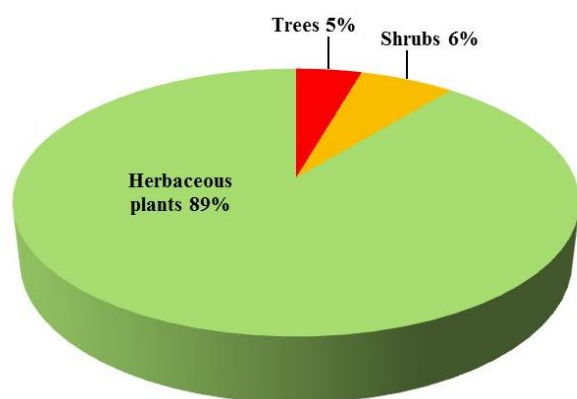


Fig. 6: Percentage of trees, shrubs and herbaceous taxa in Natura 2000 site Cheile Turzii (sample of 607 vascular plants)

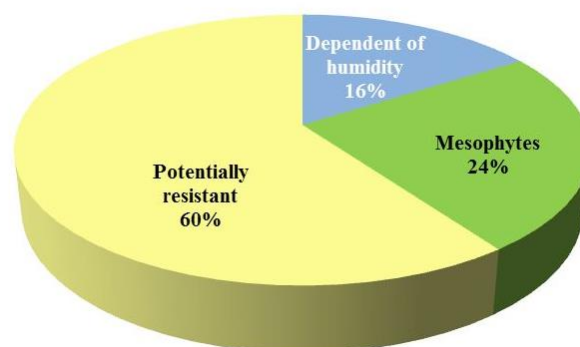


Fig. 8: Natura 2000 site Cheile Turzii, percentage of plants sensitive (dependent on humidity) and potentially resistant to moisture decrease (sample of 607 vascular plants)

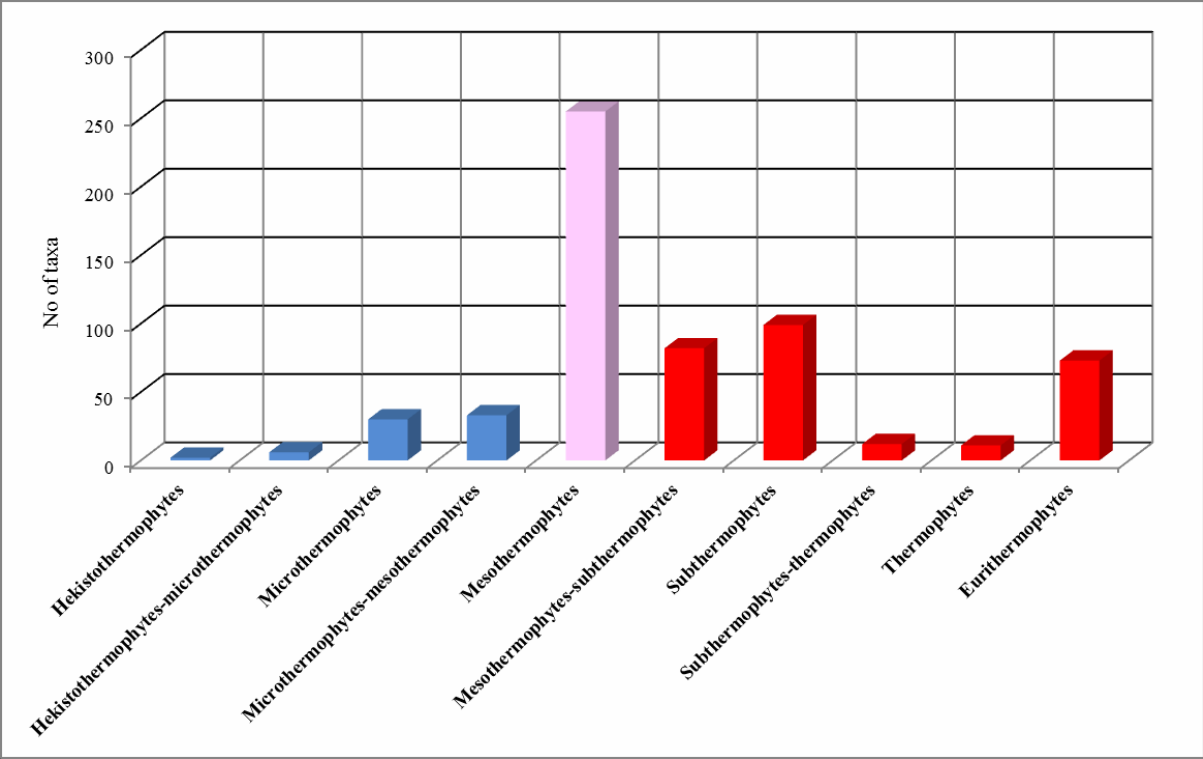


Fig. 9: Natura 2000 site Cheile Turzii. Air temperature: composition in ecological categories (hekistothermophytes, hekistothermophytes-microthermophytes, microthermophytes, microthermophytes-mesothermophytes, mesothermophytes, mesothermophytes-subthermophytes, subthermophytes, subthermophytes-thermophytes, thermophytes, eurithermophytes), of a sample of 607 vascular plants



Photo 4: *Echium maculatum* L. (xeromesophyte and subthermophyte), Cheile Turzii (Foto: Anca Sârbu)

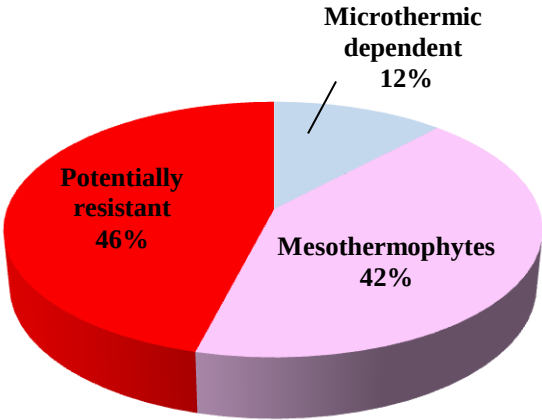


Fig. 10: Natura 2000 site Cheile Turzii, percentage of plants sensitive (microthermic dependent) and potentially resistant to temperature increase (sample of 607 vascular plants)

Table 2: Trees, shrubs and sub-shrubs from Cheile Turzii and their ecological preferences in terms of humidity and temperature

Taxa	Humidity (ecological categories)	Temperatur e (ecological
<i>Acer platanoides</i> L.	mesophyte	mesothermophyte
<i>Alnus glutinosa</i> (L.) Gaertn.	hygrophyte	mesothermophyte
<i>Alnus incana</i> (L.) Moench.	mesohygrophyte	microthermophyte
<i>Amorpha fruticosa</i> L.	mesophyte	subthermophyte
<i>Carpinus betulus</i> L.	mesophyte	mesothermophyte
<i>Cornus sanguinea</i> L.	mesophyte	mesothermophyte
<i>Corylus avellana</i> L.	mesophyte	mesothermophyte
<i>Euonymus europaeus</i> L.	mesophyte	mesothermophyte
<i>Fagus sylvatica</i> L.	mesophyte	mesothermophyte
<i>Frangula alnus</i> Mill.	mesohygrophyte	mesothermophyte
<i>Fraxinus excelsior</i> L.	mesophyte	mesothermophyte
<i>Genista sagittalis</i> L.	mesophyte	mesothermophyte
<i>Helianthemum rupifragum</i> A. Kern.	xeromesophyte-mesophyte	hekistothermophyte-microthermophyte
<i>Malus sylvestris</i> (L.) Mill.	mesophyte-mesohygrophyte	mesothermophyte
<i>Populus nigra</i> L.	mesohygrophyte	mesothermophyte
<i>Quercus robur</i> L.	mesophyte-mesohygrophyte	mesothermophyte
<i>Rubus caesius</i> L.	mesohygrophyte-hygrophyte	mesothermophyte
<i>Rubus idaeus</i> L.	mesophyte	mesothermophyte
<i>Salix alba</i> L.	hygrophyte	mesothermophyte
<i>Salix caprea</i> L.	mesophyte	mesothermophyte
<i>Salix fragilis</i> L.	hygrophyte	mesothermophyte
<i>Sorbus aucuparia</i> L.	mesophyte	microthermophyte-mesothermophyte
<i>Spiraea chamaedryfolia</i> L.	mesophyte	microthermophyte-mesothermophyte
<i>Tilia cordata</i> Mill.	mesophyte	mesothermophyte
<i>Ulmus glabra</i> Huds.	mesohygrophyte	mesothermophyte
<i>Vaccinium myrtillus</i> L.	euriphyte	microthermophyte
<i>Viburnum lantana</i> L.	xeromesophyte-mesophyte	microthermophyte-mesothermophyte
<i>Viburnum opulus</i> L.	mesohygrophyte	mesothermophyte

Discussion

For Romania, as for all countries of Central and Eastern Europe, a clear temperature rise is projected for the future. The projections for precipitation show a significant spatial and temporal variability with tendencies for a decrease in summer precipitation [1].

It is expected that these climatic changes in temperature and precipitation will influence the diversity of plants and plant communities in different protected areas of Romania. Climate change is happening and will continue to have consequences for the plants and plants communities from different protected areas, but the impacts and vulnerabilities can differ considerably across regions.

Not many studies have been made in Romania on the potential sensitivity of Natura 2000 sites to climate change. However, information on the flora of mountain and alpine habitats in the Natura 2000 site of Bucegi demonstrates the sensitivity of plants to climate change and especially global warming, associated with milder winters with less snow [23, 24].

At the European level there is an ample evidence for ecological responses of individual plant species or plant communities to recent climate change [28]. The ecological preferences of plants with respect to environmental parameters represent a significant aspect of their potential vulnerability to climate change effects [13]. Predictions of ecological responses of plants to climate change are based largely on their capacity to adapt, which depends upon their ecological plasticity [9].

The results of evaluations performed on the two protected areas, Suatu and Cheile Turzii from Transylvania, reveal some aspects useful in predicting their future evolution, in terms of climate change.

In this sense, we can consider that the sub-Pannonic steppic grasslands, Natura 2000 habitat type 6240*, present in both areas studied, has a floristic structure that allows short-term tolerance of climate change. Floristic elements with conservative value also have the ability to withstand increases in temperature and moisture variations in the regime expected.

Natura 2000 site Cheile Turzii, which hosts a variety of habitat types, some of which depend on humidity or low temperatures, can be considered much more vulnerable to the effects of projected climate change. Some Natura 2000 habitat types of this site as well, hydrophilous tall herb fringe communities, alluvial forests, calcareous and calcareous schist screes of the montane to alpine levels, chasmophytic vegetation from high altitudes, may be seriously affected in the future. The hydrophyte, hygrophite, mesohygrophite, hekistothermophyte and microthermophyte plants may become threatened by future climatic modification. For example, plant taxa such as *Caltha palustris*, *Chrysosplenium alternifolium* and *Doronicum columnae*, strongly dependent on water supply, or those such as *Myosotis alpestris* F.W. Schmidt, *Antennaria dioica* (L.) Gaertn. and *Viola joóii* Janka, strongly dependent on low temperature may lose out in the future.

In the conditions of present and predicted climatic modifications the meso-xerophyte, xerothermophyte, mesothermophyte, subthermophyte, thermophyte and euriphyte plants and the plant communities better adapted to drought and warm weather such as sub-Pannonic steppic grasslands from Suatu and from Cheile Turzii have a greater chance to adapt and to persist.

Conclusions

✓ Up to the end of this century, warmer and drier conditions are projected for Romania.

✓ It can be expected that the protected areas in Transylvania will be affected differently, depending on the sensitivity of plants species and species communities, to the effects of climate change.

✓ The sub-Pannonic steppic grasslands of Suatu botanical reserve can be considered as a habitat type which may be less affected by climate change impacts, because more than 90% of vascular plants, including all the protected taxa, are potentially resistant to temperature increase and moisture decrease.

✓ The plant diversity of the Natura 2000 site Cheile Turzii, which accommodates a diversity of habitat types with different ecological requirements may be more affected in the future by climatic effects. In this area only 60% of vascular plants and 85% of protected taxa are potentially resistant to temperature increase and moisture decrease and 75% of the woody plants are potentially sensitive to the predicted climate modifications in moisture or temperature.

✓ The data from this analysis are not sufficient to predict the future of the two protected areas, but they offer information on potential sensitivity of plants to climate change and on some potential threats to be expected in the future.

✓ Other factors such as the seasonal changes, which can strongly affect the self-regulation capacity of the plants, the cumulative effects induced by the climate modifications and the pressure of human activities need to be also considered, in the general process of prediction.

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ARIILE PROTEJATE ȘI SCHIMBĂRILE CLIMATICE

(Rezumat)

Prezenta lucrare se adresează ariilor protejate Suatu I & II (parte a sitului Natura 2000 Suatu-Cojocna-Crairât) și Cheile Turzii (sit Natura 2000) localizate în zone termofile și xerofile din Transilvania. Lucrarea își propune să ofere informații referitoare la potențiala sensibilitate a florei față de schimbările climatice prognozate pentru acest secol. Au fost luați în considerare 780 de taxoni (607 taxoni – Cheile Turzii și 173 taxoni – Suatu) ale căror cerințe față de umiditate și temperatură au fost evaluate pe baza literaturii de specialitate. O atenție deosebită s-a acordat plantelor protejate. Rezultatele obținute au evidențiat următoarele aspecte: i) plantele prezente în cele două arii protejate sunt în foarte mică măsură sensibile la potențialele schimbări climatice; ii) taxonii rezistenți sunt predominanți atât în cazul ariilor protejate Suatu I & II (90%), cât și în cazul ariei protejate Cheile Turzii (60%); iii) toți taxonii protejați din Suatu I & II sunt potențial rezistenți față de schimbările prognozate pentru regimul termic și al umidității, iar cei din Cheile Turzii sunt doar în proporție de 10% sensibili; iv) în proporție semnificativă (75%) arborii au evidențiat sensibilitate față de reducerea umidității edafice. Datele incluse în această lucrare nu sunt suficiente pentru a putea prognoza evoluția viitoare a florei din cele două arii protejate, dar oferă o serie de indicii asupra sensibilității plantelor față de schimbările climatice la care ne-am putea aștepta.