

## THE PROPOSAL OF RARE PLANT SPECIES OF THE VALLEY OF RIVER PČINJA NOMINATED FOR PROTECTION

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### ABSTRACT

Avramović D., Nikolić Lj., Zlatković B. & Randelović N. (2008): The proposal of rare plant species of the valley of river Pčinja nominated for protection. Proceedings of the III Congress of Ecologists of the Republic of Macedonia with International Participation, 06-09.10.2007, Struga. Special issues of Macedonian Ecological Society, Vol. 8, Skopje.

The valley of Pčinja, on its flow through Macedonia, is distinguished by outstanding floristic diversity. Until now, for this area, over 1000 plant species are established, and our estimate is that there are over 1300 taxons as species and subspecies. At flora of this area, the next families stand out with their richness: *Fabaceae* (126), *Asteraceae* (102), *Poaceae* (69), *Lamiaceae* (61), *Caryophyllaceae* (51), *Brassicaceae* (50) etc. The genera with the biggest number of species are: *Trifolium* (36), *Euphorbia* (16), *Potentilla* (15), *Silene*, *Vicia* (13), *Astragalus* and *Centaurea* (12).

The more intensive relying of human economy on nature resources resulted with bigger use of nature potentials where the flora belongs also. Because of that, the primary nature vegetations are degraded and some associations and plant species populations which became small numerically and limited because of secondary influences, are destroyed or they differed primarily with small areals. By influencing of different negative factors, some number of populations is already destroyed, and the populations of many plant species became very endangered, so they are threatened by dying out. These plant species are become very rare and endangered, so they need the applying of urgent *in situ* and *ex situ* ways of protection.

In the Valley of river Pčinja that belongs territory of R. Macedonia, the following plant species and their populations are most endangered: *Adonis vernalis*, *Astragalus angustifolius*, *A. wilmottianus*, *A. suberosus*, *Crocus rujanensis*, *Chnicus bulgaricus*, *Centaurea tuberosa*, *Dianthus vodnensis*, *Fritillaria orientalis*, *Phelipaea boissieri*, *Ramonda nathaliae*, *Stachys horvaticii*, *Satureja fukarekii* and *Tulipa scardica*.

### ИЗВОД

Аврамовиќ Д., Николиќ Љ., Златковиќ Б. и Ранѓеловиќ Н. (2008). Предлог на ретки растителни видови по долината на река Пчиња номинирани за заштита. Зборник на трудови од III Конгрес на еколозите на Македонија со меѓународно учество, 06-09.10.2007, Струга. Посебни изданија на Македонското еколошко друштво, Кн. 8, Скопје.

Долината на река Пчиња, посебно низ нејзиниот текот на територијата на Р. Македонија се истакнува со изразен флористички диверзитет. До сега за оваа подрачје се утврдени преку 1000 растителни видови, а наша проценка е дека тој број ќе биде околу 1300 таксони на ниво на видови и подвидови.

Во флората на наведеното подрачје посебно со богатство на видови се истакнуваат следниве фамилии: *Fabaceae* (126), *Asteraceae* (102), *Poaceae* (69), *Lamiaceae* (61), *Caryophyllaceae* (51), *Brassicaceae* (50) и др. Од родовите со најголем број видови се истакнуваат: *Trifolium* (36), *Euphorbia* (16), *Potentilla* (15), *Silene* и *Vicia* (13) и *Astragalus* и *Centaurea* (12). Големиот економски развој на човекот, кој се повеќе се потпира на природните ресурси во кои спаѓа и растителниот свет доведе до деградација на примарната природна вегетација и уништување на одредени растителни заедници и популации на видови кои под дејство на тоа влијание станаа релативно малубројни и со ограничен ареал. Влијанието на различни негативни фактори доведе да еден број популации бидат уништени, а одреден број на растителни видови станаа многу загрозувани така да им прети нивно уништување. Одредени растителни видови на оваа подрачје се многу загрозувани и ретки така да бараат итни *in situ* и *ex situ* мерки за заштита.

По долината на река Пчиња, посебно во делот на територија на Р Македонија најзагрозени се следниве растителни видови: *Adonis vernalis*, *Astragalus angustifolius*, *A. wilmottianus*, *A. suberosus*, *Crocus rujanensis*, *Cnicus bulgaricus*, *Centaurea tuberosa*, *Dianthus vodnensis*, *Fritillaria orientalis*, *Phelipaea boissieri*, *Ramonda nathaliae*, *Stachys horvaticii*, *Satureja fukarekii* и *Tulipa scardica*.

### Introduction

The Valley of the river Pčinja includes the area which is situated at last, northeast part of R. Macedonia. Actual, it includes the part of this valley that ranges from the monastery Saint Prohor Pčinjski, down the river, near to place where the river Pčinja goes from the territory of R. Serbia, to Blace where the Pčinja junction at the river Vardar is situated.

The most reliable index of biodiversity endanger shows vanished, disappeared and endangered plant and animal species. The most frequent causes of some species vanishing are the lost of their habitat and inadequate management of nature resources.

Proportionally to size and to direction of territory extending, Macedonia is characterized by great genetic, species and ecosystem diversity. Because of that, it is classified as one of the most important regions of biological diversity in Europe. The territory of Macedonia is populated by 43% plant species of total European flora. On the basis of international criteria, the territory of Macedonia, together with mountains of Serbia and Bulgaria, is classified as one of the six European and one of 160 world centers of biological diversity. In territory of this state, there is 2700 vascular plants. However, because of industrial development and population growing, many plant species are vanished irretrievably, and there is great number of critically endangered species also.

The first level of protection includes permanent monitoring of plant populations which are threatened by disappearing and publishing these datas. The second level goes into legislature area. It is expected that legislation level of protection will become more intensified soon because the european regulations of nature protection will be adopted. That will be desirable because present 6,5% of territory under protection in Macedonia will increase around 11% until 2010.

Besides some nature factors which permanently, acting spontaneously, lead to pushing out of

rare plant species, the anthropogenic factor is crucial factor of endanger of thinned and threatened plants majority in the valley of the river Pčinja with indirect (the cultivation of soil, the afforesting, the pasture...) as well as direct influence (picking of decorative species, excessive exploitation of medicinal herbs, the fires...).

### The floristic diversity of the valley of the river Pčinja

Lasting several years researches of flora of the Valley of the river Pčinja showed that this area is meaningly rich with plant species. More precisely, until present days the 1002 plant species are established, and our estimate is that number will grow from 1250 to 1350 taxons. The most representative species belong to next familias: *Fabaceae* 125, *Asteraceae* 102, *Poaceae* 69, *Caryophyllaceae* 51, *Brassicaceae* 50, *Rosaceae* 42, *Liliaceae* 33 etc., from 88 familias which are determined at flora of this area.

The total number of the genus is 409, and the richest with species are next genus: *Trifolium* 36, *Euphorbia* 16, *Potentilla* 15, *Silene* 13, *Vicia* 13, *Astragalus* 12, *Centaurea* 12 species etc.

As far as endanger is concerned, the valley of the river Pčinja can be classified in area with relatively endangered flora because from 1002 plant species, 37 are critically endangered, 113 are endangered and 445 are nearly threatened, while 208 are vulnerable (Tab. 1).

The general principles of work, the estimate of endangered plant taxons and their distribution in region and in whole territory of Macedonia are based, besides the lasting several years researches of the authors, on the datas from region floristic paperworks and national Flora of Macedonia and next states. The estimate of endenger and membership of plant taxons to categories of endenger is synchronized with criterias defined by IUCN (*Internation-*

**Tab. 1.** The endanger level of the plant species in the valley of the river Pčinja

The endanger level by IUCN categories	The number of endangered taxons	% of total flora of valley Pčinja
<i>Critically Endangered</i> (CR, critically endangered taxons in direct danger of vanishing)	37	3.69
<i>Endangered</i> (EN, endangered taxons, at danger of vanishing)	113	11.28
<i>Near Threatened</i> (NT, taxon near to be endangered)	445	44.41
<i>Vulnerable</i> (VU, vulnerable taxons)	208	20.76
<i>Low Risk</i> (LR- low propability of endenger)	68	6.79
<i>Least Concern</i> (LC, category with least concer)	131	13.07
<b>Total:</b>	<b>1002</b>	<b>100.00</b>

al Union for Conservation of Nature) for 2007. (including and category *Last Concern*, LC). The results of analysis, the numeric presence of endangered taxa by categories and their participation at total flora of the Valley of the Pčinja in Macedonia are represented on Tab. 1.

### The rare and endangered plant species in the valley of the river Pčinja

According to its geographic position, geological structure, pedologic substratum, the valley of the river Pčinja is area which represents the area with exceptional diversity, where the many plant species found shelter on own migratory path from area of Aegean Mediterranean to continent, and from continental area to Mediterranean.

The flora of the valley of Pčinja consists of elements with different origin and age. At total flora, the species of Mediterranean-Submediterranean type of areal dominate, and their presence is specially significant in central, limestone part of area. In that area of the flow, the valley of Pčinja is represented by stately gorge and exposed limestone slopes

with specific flora and vegetation which is different than remaind, high part of flow, showing the characteristics of Macedono-Trakian province of European-Submediterranean floristic subregion. The influences of Macedono-Trakian floristic province on florogenesis of this area are enabled by the valleys of great rivers of Aegean watershed, mainly by Vardar. They spreaded out through the valleys of Vardar and Pčinja, and through their tributaries to the last south parts of Serba forming horion enclaves. The penetration of elements of Aegean Mediterranean in north part of watershed area of Vardar are intensive in region which includes the low and some part of middle part of Pčinja flow where they are strongly favored by warm limestone and serpentine basis.

Analyzing the rare and endangered plant species, we got the fact that the valley of the river Pčinja represents the **only discovery** of some plant species in the area of Macedonia, and they are: *Adonis vernalis*, *Astragalus austriacus*, *Crocus rujanensis* i *Stachys horvaticii* (Tab. 2.).

The second group of rare and endangered plant species is represented by these species which have the valley of the river Pčinja for **one of the rare**

**Tab. 2.** The review of plant species that have river Pčinja for only discovery

Species	Discovery	Estimated number of individuals in population	Habitat	Importance
<i>Adonis vernalis</i>	Krasta- Pčinja	> 100	steppelike pastures on limestone	medicinal, alkaloid herb
<i>Astragalus austriacus</i>	Bislim - Ku	> 100	steppelike pastures and rockygrounds	steppe relic species, phytoaccumulate Se
<i>Crocus rujanensis</i>	Rujan mountain	> 1000	steppe pastures and thermofil forests	decorative species
<i>Stachys horvaticii</i>	Bislim - Ku	> 1000	the rocks and rocky-grounds on dolomite marbles	medicinal and decorative plant species

**Tab. 3.** The review of plant species that have the valley of the river Pčinja for one of the rare discovery on the territory of Macedonia

Species	Discovery	The estimated number of individuals in population	Habitat	Importance
<i>Achillea fraasii</i>	village Pčinja	< 10	dolomite marbles	medicinal
<i>Astragalus haarbachii</i>	Krasta- Pčinja	≤ 100	dolomite marbles	phytoaccumulate Se
<i>Astragalus sinaicus</i>	Krasta- Pčinja	≤ 100	dolomite marbles	phytoaccumulate Se
<i>A. wilmottianus</i>	Bislim, Ruen	> 1000	dolomite marbles	steppe relic species, phytoaccumulate Se
<i>Centaurea tuberosa</i>	Ruen	< 30	forest of hornbeam	medicinal herb
<i>Cnicus bulgaricus</i>	Ruen	< 50	steppe pasture	medicinal herb
<i>Fritillaria orientalis</i>	Bisllim	< 10	underbrush of hornbeam	decorative plant species
<i>Phelipaea boissieri</i>	Bislim	< 10	underbrush of hornbeam	decorative plant species
<i>Ramonda nathaliae</i>	Bislim, s. Pčinja	< 300	dolomite marbles	tertiary relict
<i>Satureja fukarekii</i>	Bislim, s Pčinja	< 1000	dolomite marbles	spice, medicinal herb
<i>Silene friwaldskjana</i>	Ruen	< 100	granodiorits	endem
<i>Tulipa scardica</i>	Bislim	< 10	dolomite marbles	decorative plant species

**discovery.** Next species belong to this group: *Achillea frassii*, *Astragalus harbachii*, *Astragalus sinaicus*, *Astragalus wilmottianus*, *Centaurea tuberosa*, *Cnicus bulgaricus*, *Fritillaria orientalis*, *Phelipaea boissieri*, *Ramonda nathaliae*, *Satureja fukarekii*, *Silene friwaldskiyana* and *Tulipa scardica*. The actual localities of endangered taxons of the Valley of Pčinja, their habitats, the importance and the estimated number of the individuals in population are showed in the Tab. 3.

Analizing the flora of the valley of the river Pčinja and the level of its endanger we got the fact that totally 37 taxons from this area are critically endangered (CR) by influence of, first of all, anthropogenic factor, but by some ecologic factors also which are climate integral part of the valley of the river Pčinja. Considering all, we suggest that all taxons from the list are put on the list of the rare and endangered plant species which will be protected by different legal and sublegal acts of Republic Macedonia. The list of proposed plant species is showed in the Tab. 4.

## Conclusion

Great floristic diversity of the flora of the valley of river Pčinja is confirmed by calculating of the quantitative indexes. The done analysis of genus coefficient (G) and index of the taxonomic diversity (D) and their comparison with same indexes of adjacent mountains of Macedonia and Serbia are represented on Tab. 5.

On the basis of previous, preliminary researches, 37 taxons belong to the group of critically endangered taxons (CR) in the valley of the river Pčinja, but this is not final number.

In the paper, there are represented 37 critically endangered taxons at direct danger of vanishing (CR), which, on this occasion, are suggested for urgent protection, while there are even 113 taxons at category EN (endangered taxons, in danger of vanishing). We point out the fact that among them, there are those which have population, according to present researches, with less of 10 individuals, and their only discovery is on territory of Macedonia, at Bal-

**Tab. 4.** The endangered plant species of the valley of the river Pčinja proposed for protection

The endangered plant species of the valley of the river Pčinja	
<i>Achillea clypeolata</i>	<i>Dianthus vodnensis</i>
<i>Achillea fraasii</i>	<i>Ephedra major</i>
<i>Achillea serbica</i>	<i>Erysimum comatum</i>
<i>Adonis vernalis</i>	<i>Fritillaria graeca</i>
<i>Alkana nonneiformis</i>	<i>Fritillaria orientalis</i>
<i>Alkana primuliflora</i>	<i>Goniolimon dalmaticum</i>
<i>Ameria rumelica</i>	<i>Goniolimon tataricum</i>
<i>Astragalus austriacus</i>	<i>Haplophyllium boissierianum</i>
<i>Astragalus harbachii</i>	<i>Hypericum rumelicum</i>
<i>Astragalus sinaicus</i>	<i>Inula verbescifolia</i>
<i>Astragalus spruneri</i>	ssp. <i>aschersoniana</i>
<i>Astragalus wilmottianus</i>	<i>Phelipaea boissieri</i>
<i>Bupleurum apiculatum</i>	<i>Podocytisus caramanicus</i>
<i>Centaurea attica</i>	<i>Potentilla balcanica</i>
<i>Centaurea graeca</i>	<i>Ramonda nathaliae</i>
<i>Centaurea griserbachii</i>	<i>Satureja fukarekii</i>
<i>Centaurea pollida</i>	<i>Saxifraga graeca</i>
<i>Centaurea tuberosa</i>	<i>Scabiosa fumarioides</i>
<i>Cerastium petricola</i>	<i>Sedum stefschro</i>
<i>Cnicus bulgaricus</i>	<i>Sempervivum kindingeri</i>
<i>Crocus rujanensis</i>	<i>Silene friwaldzkyana</i>
<i>Cytisus petrovicii</i>	<i>Silene lerchenfeldiana</i>
<i>Delphinium balcanicum</i>	<i>Stachys horvaticii</i>
<i>Dianthus cruentus</i>	<i>Stachys plumosa</i>
<i>Dianthus gracilis</i>	<i>Stachys serbica</i>
<i>Dianthus pallens</i>	<i>Tragopogon balcanicum</i>
<i>Dianthus pinifolius</i>	<i>Trifolium heldraichianum</i>
<i>Dianthus quadrangulus</i>	<i>Trifolium trichopterum</i>
<i>Dianthus viscidus</i>	<i>Tulipa scardica</i>

**Tab. 5.** Parallel review of genus coefficient (G) and index of taxonomic diversity (D)

	Macedonia	The Valley of Pčinja	Serbia	Rudina Mountain	Balkan Peninsula
<b>G</b>	24,86	40,82	21,50	50,64	14,19
<b>D</b>	15,12	12,91	12,83	13,41	11,66

kan peninsula or exclusively the valley of the river Pčinja.

We expect that the future researches of floristic diversity of the valley of the river Pčinja, that we intend to continue, and the estimate of level of their endanger will give the final picture of flora status in this area.

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