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Results of rare species research within areas of special protection of Stavropol Territory

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Ключевые слова:

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Аннотация:

Авторами представлены результаты обследования трех особо охраняемых природных территорий Ставропольского края за период с 2009 по 2013 год. Уточнены места обитания 22 редких и исчезающих видов местной флоры. Обсуждаются вопросы современного состояния ценопопуляций: численность, жизненность, структура, экологические предпочтения, лимитирующие факторы указанных видов. С помощью технологий GPS определены их координаты и занимаемая территория. Особого внимания заслуживают редкие и исчезающие виды I и II категории.

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Introduction

Stavropol Territory is located in the South of the Russia's European part, in the Pre-Caucasian area. The biggest part of the Territory is covered with steppe and semidesertic natural zone; 1.5% of the territory is occupied with broadleaved and woodland forests. The climate is continental; the average temperature in January reaches 4-10 C° below zero, the average temperature in July – 22-25 C° above zero; the annual rainfall is 300-800 mm. Stavropol Territory is divided into the lowland and waste plain. The ground within the Stavropol Territory is mainly divided into chernozem soils and chestnut soils. Approximately 2,450 supreme tracheophytes plants of wildlife species grow within the Stavropol Territory. Despite the fact that this territory is situated in the steppelatitude, plants of the European forests, as well as from Western-Asian semideserts and deserts, can be found here, too.

Initially the problem of nature protection of the North Caucasus was considered in the late 80s and early 90s of the 19th century. The scientists of that time tried to find ways to control desertification of the Stavropol Province. The scientific study of grassy vegetation was implemented only in early 20th century, when I.V. Novopokrovskiy, V.N. Kononov, V.G. Tanfiliev, E.A. Bush, A.A. Grossgeim, A.I. Galushko and others carried out a research and described some regions of the Stavropol area and the North Caucasus. Nevertheless, it was not enough to study the local, it was necessary to reinstate ploughed up grazing lands and logged forest areas.

Stavropol Botanic Garden was established in 1959. Its work was mainly focused on introduction, research, rational use and preservation of flora. Nature-oriented activity of the Botanic Garden was aimed at flora preservation through working out the methodology of its reinstate. In the 60s to 80s of the last century, V.V. Skripchinskiy was the research advisor of the expeditions in the Stavropol Territory. Invaluable contribution into the research of Stavropolye flora, including rare species, was made by such outstanding scientists as V.G. Tanfiliev, V.V. Skripchinskiy, Y.A. Dudar, D.S. Dzybov, G.T. Shevchenko and others. V.V. Skripchinskiy was in charge to collect rare and endangered species of plants in the USSR in Botanic Gardens. More than 400 taxa, mainly geophytes were grown in the exhibition area. In the 1990s, due to some circumstances, the problem of rare flora species research was no more of primary importance. In this respect, U.N. Gorbunov and M.L. Orlenko are worth citing: "For the last decade they start to understand that biological diversity lays the basis to support ecological condition of the existence and economic development of the human society". Currently, the state nature conservation programme of

rare and endangered species of local flora has been stated by law. The environmental monitoring research of rare and endangered species across the territory of Stavropol Territory has been started since then.

Objects and methods of research

The scientific research to define the area of the growth for the rare and endangered species of plants was carried out across the protected zones: “Kutsai” Mountain, “Bryck.” Mountain, “Bazhigan” (nature reserve), the outskirts of Blagodarny town, the “Velichaevskoye” village (Fig. 1 - 2). The subjects of investigation are 22 rare species which are included to the Red Data Book of the Stavropol Territory, Ivanov, (2013).



Fig 1. Reporting of rare and endangered species. (<http://www.mail-karta.ru>).

The process of local population search was carried out referring to the results of the previous scientific research and references. To define the population area and its coordinates, GPS techniques were used. Transect method was used to set up the permanent plots across the whole territory where a population was found. The size of the permanent plot was nine square meters. To specify the capacity and the total viability population in real-life conditions it was necessary to set up the area size of the population which was found by means of GPS technologies based on identifying the source coordinates of some points according to the self edge. A population is the total number of particular plants within the territory covered with population. We can differentiate three main types of the population structure: even structure, accidental structure and group species distribution. The viability of population is determined according to the following rating scale:

- 1 scores – plants are poorly-developed in a vegetative phase, do not blossom, do not fruit, plants are suppressed;
- 2 scores – plants are developed in a vegetative phase, but mass and size lag (retardation), do not blossom, do not fruit;
- 3 scores – plants are well-developed, do not blossom, do not fruit;
- 4 scores – plants look like well-developed with non-active blossoming and fruiting, juvenile population is limited and taken ill;
- 5 scores – plants look like well-developed, sound, flourish a lot, fruit a lot, population is growing, Denisova, Nikitina, Zaugolnova (1986), Isaenko (2011).



Fig. 2. Reporting of rare and endangered species. (<http://www.mail-karta.ru>).

The abundance of species Cenosis is determined according to Drude's scale:

- cop³ – there are a lot of plants in this area
- cop² – there are plants in this area
- cop¹ – there are quite enough plants in this area
- sp – plants are scattered in this area (sporadically)
- sol – plants are solitary in this area
- un – plants are unitary in this area

Results and discussion

For the last five years the research of the following mostly preserved state and local areas has been carried out (Table 1):

Table 1. Natural areas being investigated for the period 2009-2013

№	The geographical name of investigated natural area	Administrative region
1	Hole "Semistozhki", Mountain Bruck	Andropovsky
3	Outskirts Divnoye Village, lakeside Manuch-Gudilo	Apanasenkovsky
4	Outskirts of Velichaevskoye Village	Levokumsky
5	Mountain Beshtau (partially)	Mineralnye Vody
6	Special Natural Reserve «Bazhigan»	Nephtekumsky
7	Mountain Kutsai	Petrovsky
8	Outskirts of Blagodarny town	Blagodarnensky
9	Balka Vtoroy Log, Vishnevaya Polyana, Outskirts of Molochny Farm, Novomaryevskaya Polyana, Mountain Strizhament (Bolshaya and Malaya Soldatskiye Polyany), Chetvertaya Balka, Mountain Budarka.	Shpakovsky

Table 2. Research results of some extremely protected zones across Stavropol'skiy Krai in 2011-2013

Investigated area	Species	Abundance of species in census	Vitality population, score	Pattern of population distribution*	Ecological conditions of growth	Limiting anthropogenic factor	Area	Coordinates of species center of location, altitude above sea
Mountain Kutsai	<i>Gypsophila globulosa</i> Stev. ex Boiss.	cop ³	5	even	Steppe stony areas with sandstone efficiency	Locality violation while building, enhanced recreational sterss	1,07	45,312651° N 42,839868° E H 294 м.
	<i>Astragalus bungeanus</i> Boiss.	cop ¹	5	group				
	<i>Astragalus pseudotataricus</i> Boiss.	sp	3	group				
	<i>Jurinea ewersmannii</i> Bunge	sp	4	even				
	<i>Jurinea ciscaucasica</i> Iljin	sp	4	accidental				
	<i>Thymus daghestanicus</i> Klok. et Shost.	cop ¹	4	group				
Mountain Kutsai	<i>Astragalus longipetalus</i> Chater	sp	3	accidental	Steppe slopes on sand and stone soil	Locality violation while building	2,2	45,316159° N 42,839765° E H 280 м
	<i>Psephellus annae</i> Galushko	cop ³	5	group				
	<i>Scabio saisetensis</i> L.	cop ²	5	group				
	<i>Erodium stevenii</i> Bieb.	cop ²	5	group				
Mountain Bruck	<i>Thymus daghestanicus</i> Klok. et Shost.	sp	3	group	Steppe sand-stony slope	pasture	0,5	44,553529° N 42,609355° E H 655 м
	<i>Medicago cancellata</i> Bieb.	cop ¹	5	accidental				
	<i>Psephellus annae</i> Galushko	sp	4	accidental				
Mountain Bruck	<i>Allium inaequale</i> Janka	sol	4	accidental	Stony-steppe slope	pasture	2,4	44,563953° N 42,608130° E H 641 м
	<i>Thymus daghestanicus</i> Klok. et Shost	sp	4	accidental				
	<i>Psephellus annae</i> Galushko	sp	4	accidental				
	<i>Stipa pennata</i> L.	cop ³	5	even				
	<i>Gypsophila globulosa</i> Stev ex Boiss.	sp	3	accidental				
	<i>Astragalus bungeanus</i> Boiss.	cop ²	5	accidental				
	<i>Astragalus calycinus</i> Bieb.	cop ²	5	accidental				
	<i>Astragalus pseudotataricus</i> Boiss.	sp	4	accidental				
<i>Iris furcated</i> Bieb	sp	5	group					
Spur of Mountain Bruck (outsirts of Sultan Village)	<i>Astragalus pseudotataricus</i> Boiss.	cop ¹	4	even	Stony steppe slope with shallow soils	pasture	1,1	44,567387° N 42,624404° E H 531м
	<i>Medicago cancellata</i> Bieb.	cop ²	5	accidental				
	<i>Thymus daghestanicus</i> Klok. et Shost.	cop ²	5	group				
	<i>Jurinea multiflora</i> B. Fedtsch.	sp	3	accidental				
	<i>Gypsophila globulosa</i> Stev. ex Boiss.	sp	4	accidental				
Outskirts of Velichaevskoye Village	<i>Iris pseudocorus</i> L.	sol	3	accidental	Damp solonetzic soil	Bouquet gathering to use plants for landscaping	0,01	44,937120° N 45,125573° E H 29 м
	<i>Iris pseudonotha</i> Galushko	sol	3	accidental				
State Natural Reserve Bazhigan	<i>Astragalus longipetalus</i> Chater	un	3	accidental	solonetzic soils clay hillocks	pasture	2	44,507536° N 45,022025° E H 61 м
	<i>Goniolimon bessarianum</i> Kusn.	sp	4	accidental				
	<i>Iris scariosa</i> Willd. ex Link.	cop ¹	4	group				
	<i>Tulipa biebersteiniana</i> Schult. Et Shult. fil.	sol	4	even				
Outskirts of Blagodarny town	<i>Astragalus brachicarpus</i> Bieb.	sol	4	accidental	Herb-bunchgrass meadow steppe sand and stony soils	Locality violation while building	1,5	45,121094° N 43,278625° E H 201 м
	<i>Astragalus bungeanus</i> Boiss	sol	4	group				

*Pattern of the population distribution:

random distribution – found in a very uniform environment; organisms do not tend to form groups;
 homogeneous – occurs in a population with a strong competition between the individuals, or with antagonism between individuals which promotes uniform distribution in space; group – the most common distribution option of individuals in the population that occurs due to mutual existence in a close location.

The present article covers results of a monitored research conducted in 2009-2013 (Table 2, sample 1-2). According to the results of this research, we can conclude that there is approximately the same population of rare and endangered species in steppe stoned areas with sandstone and in stone-steppe slopes with small grounds. These are *Astragalus bungeanus* Boiss., *Thymus daghestanicus* Klok., *Jurinea ewersmannii* Bunge, *Astragalus calycinus* Bieb., *Gypsophila globulosa* Stev. ex Boiss., *Psephellus annae* Galushko, *Astragalus pseudotataricus* Boiss and others. Thus, we can speak about two kinds of extremely preserved natural areas: Kutsai Mountain and Bruck Mountain. Referring to the population analysis of taxa examined we can conclude that it

is necessary to pay more attention to rare and endangered species and species with relatively high degree of population that are currently decreasing rapidly. These are the species of the I and II categories, Borodin, Bannikov, Sokolov & AL. (1984), Panasenko, Ivanov, Sigida, (2002). As a rule, these are the I and II populations with a relatively small number of species of *Iris scariosa* Willd. ex Link, *Goniolimon besserianum* Kusn. («Bazhigan»), *Astragalus longipetalus* Chater («Bazhigan» and Kutsai mountain), *Jurinea ciscaucasica* Iljin (Kutsai mountain), *Medicago cancellata* Bieb. (Bruck mountain), also species with the narrow ecological plasticity, Sobolevskaya (1984). These are *Thymus daghestanicus* Klok. et Shost., *Iris pseudacorus* L., *Jurinea ewersmannii* Bunge, *Erodium stevenii* Bieb., *Scabiosa isetensis* L., *Astragalus brachycarpus* Bieb. and with the weak population viability (low reproductive ability and vegetative mobility). The results of our research proved the lack of juvenile individuals of *Astragalus longipetalus* Chater, *Iris pseudonotha* Galushko, *Goniolimon besserianum* Kusn. It would be useful to cultivate them in conditions resembling their natural habitats. There is no concern in respect to the endemics of Stavropolskiy Kray flora *Psephellus annae* Galushko, and *Astragalus bungeanus* Boiss., within the limit of the area and *Astragalus calycinus* Bieb. from locus classicus. Within the territory of 21 subjects of the studied species, the majority of them (44%) occurs quite abundantly, 34% of species is distributed in small quantities, 19% – for single and 3% – found in one. Generally, vitality of the population reaches 4-5 points, i.e. plants look normal in developed vegetative part, almost all flower and fruit. The main limiting factor in the study area is grazing on dry meadows and steppes. This calls for further monitoring and development of passive and active methods of protection for natural regeneration. The Stavropol Botanical Garden created a collection of rare and endangered species, which numbers 150 taxa. It carried out a study of their decorative qualities and adaptive features in culture. The Botanical Garden is conducting research on the state of rare plants in the conditions close to natural – using an artificial forest.

Further study of the rare species in the arid zone of the Stavropol Territory is necessary to create new protected areas.

Summary and Conclusions

There have been estimated current conditions of 22 rare and endangered species in the Mountains Kutsai and Bryck in Levokumskiy, Nephtekumskiy and partially Blagodarnenskiy regions.

All species examined are well-developed in a vegetative way; they are flourishing.

Small population species with narrow ecological plasticity and low reproductive ability deserve more attention: *Iris scariosa* Willd. ex Link, *Goniolimon besserianum* (Schult. ex Rechb.) Kusn., *Astragalus longipetalus* Chater, *Jurinea ciscaucasica* (Sosn.) Iljin, *Iris pseudacorus* L., *Erodium stevenii* M. Bieb., *Scabiosa isetensis* L., *Astragalus brachycarpus* M. Bieb., *Iris pseudonotha* Galushko etc.

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Key words:

in situ, rare species, populations, areas of special protection, growing conditions, Stavropol Territory

Summary:

The authors present results of a research of the three areas of special protection of Stavropol Territory conducted in 2009-2013. The results specify natural habitat of 22 rare and endangered species of the local flora. The article touches upon the issues of senopopulation state: population, viability, structure, environmental preferences, and limiting factors for the named species. GPS technology helps to track their location and occupied territory. Special attention is drawn to the rare and endangered species of the 1 and ii categories.

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