



Original Contribution

**NEW DATA FOR PROTECTED PLANTS OF SINITE KAMANI
NATURAL PARK SLIVEN**

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ABSTRACT

The distribution of four protected species - *Anemone sylvestris* L., *Bromus moesiacus* Velen., *Cyclamen coum* Mill., *Quercus coccifera* L. on the territory of "Sinite kamani" Natural Park has been studied. A second locality of *Quercus coccifera* has been registered for Eastern Balkan Range in the park. New populations of *Cyclamen coum* have been established. The presence of *Bromus moesiacus* for the park flora has been confirmed. The condition of all registered populations has been assessed and measures outlined for their protection.

Key words: *Anemone sylvestris*, *Bromus moesiacus*, *Cyclamen coum*, *Quercus coccifera*, Sinite kamani Natural Park

INTRODUCTION

"Sinite Kamani" Natural Park is situated on the southern slopes of the Balkan Range and it covers an area of 11,308.8 hectares. Notwithstanding the relatively small territory, it is characterized by a great diversity of species of spermatophytes and spore-bearing plants. Until now over 1060 species of vascular plants have been established for the park (1-6), comprising slightly over 25% of the ones known for the Bulgarian flora (7). Protected by the Biodiversity Act (8) are 41 species (9). Object of the present study are four of them - *Anemone sylvestris* L., *Bromus moesiacus* Velen., *Cyclamen coum* Mill., *Quercus coccifera* L.

The first species - *Anemone sylvestris* is registered on the territory of the park with two small populations of 4-5 specimens in Gagovets area by Grozeva et al. (1).

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The second species - *Bromus moesiacus* is included in Appendix 1 of the Convention on the Conservation of European Wildlife and Natural Habitats (10). According to the criteria of the IUCN Red Lists of Threatened Plants (11) it is assessed as Data Deficient. *Bromus moesiacus* is reported for Eastern Balkan Range by Stanev (12). The herbarium material deposited by the author is from the area Lale bair (SOM 139734, 01.06.1979), which is not part of the territory of the park. Andreev (13) specified the species for the park flora, but he did not deposit any herbarium material in the Bulgarian scientific herbaria (SOM, SOA, SO). During the past 32 years populations of the species have not been found in the park.

The third species - *Cyclamen coum* is included in Appendix 2 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (14). The species is reported for the Chukata area near shady wooded areas by Urumov (15). In Bulgarian scientific herbaria (SOM, SOA, SO) there are no herbarium materials from the Eastern Balkan Range.

Grozeva et al. (1) found no populations of the species in the territory of the park. In 2010 during floristic study with the participation of N. Grozeva, students from Trakia University and experts from "Sinite Kamani" Natural Park a population of *Cyclamen coum* was registered in Ablanovo area. The population numbers 12 specimens.

The fourth species - *Quercus coccifera* is included in the Red Book of the Republic of Bulgaria vol. 1 . Plants and fungi (16) in the category "endangered". The species is reported for the park by Tashev et al. (4) with one population from the Karakyutyuk area. The population numbers 11 specimens. According to the authors this is the northernmost point found in the range of that species.

The objective of this study is to supplement the information about the contemporary distribution and status of *Anemone sylvestris*, *Bromus moesiacus*, *Cyclamen coum* and *Quercus coccifera* in "Sinite Kamani" Natural Park.

MATERIAL AND METHODS

The study was conducted during the vegetation period of 2013. To establish the distribution of species the routing method was applied. The tourist routes in the park were mainly used with more or less deviations in order to cover as much as possible the habitats characteristic for each species.

Studies have been carried out mainly on the following routes:

Karandila area - Kushbunar area - Peschenik peak – Enyova bulka area - Kaloyanovi kuli area - Mollova kuria area,
 Karandila area – Chukata area – Enyova bulka area - TV Tower - Karandila Hotel complex,
 Mollova kuria area - Upper lift station – Karandila area,
 Town of Sliven – Plachi dol area - Barmuka peak - Ablanovo area,
 Ablanovo area - Bobenishteto area – Asenovets Dam,
 Kushbunar – Karandila area - TV Tower - Maryova skala area,
 Ablanovo area – Dalgia rid area,
 Ablanovo area – Plochite area – Ovcharnitsite area - Karakyutyuk area - Kostova cheshma area – Balgarka peak - Daula area,
 Town of Sliven – Slancheva polyana area - Karandila area – Microdam,

Mollova kuria area - Gornaka area - Karandila area – Mecha polyana area,
 Town of Sliven – Gagovets area,
 Town of Sliven - Novoselska River - Kuru Dere area,
 Ayazmoto area – Malka poyana area – Aremiyata area,
 Karandila area – Chukata area – Malkata chuka – Tunkata rutlina – Lokvata.

A Global positioning system (GPS) was used to determine the coordinates of the sampling points. The habitats of the species are presented on the map of Sinite kamani Natural park in scale 1: 100 000.

For taxonomic database was used Flora of PR Bulgaria (17-20), Field Guide to the Vascular Plants in Bulgaria (21), Key to the Plants of Bulgaria (22).

Soil samples from of 0-20 cm layer were collected from every studied area. Soil samples were analyzed for pH using air-dry samples with 1:2,5 soil : water ratio.

To assess the status of each population Methodology for monitoring vascular plants in Bulgaria has been used.

The voucher specimens are deposited in the herbarium of the Institute for Biodiversity and ecosystem research, Bulgarian Academy of Sciences (SOM).

RESULTS AND DISCUSSION

Anemone sylvestris

One population of the species has been found in Gagovets area (**Figure 1**), including three spots, two of which spatially overlap with the two localities of the species specified by Grozeva et al. (1). The population is located on a slightly sloping (5° - 9°), non-eroded terrain facing northwest. It is located in a vertical strip between 458-472 m a.s.l. and geographical coordinates of the center of each of the three spots are N 42° 41.754' E 26° 19.374'; N 42° 41.715' E 26° 19.406'; N 42° 41.737' E 26° 19.395'. The population has an area of 3870 m² and numbers 143 specimens. It was visited in phenophases reaching normal size the leaves, onset of flowering, flowering, fruit shaping, dropping of mature seeds.

The plant community is shrub incorporating *Fraxinus ornus* L., *Crataegus pentagyna* Jacq.,

Cornus mas L., *Carpinus orientalis* Mill., *Quercus robur* L. The parent material is limestone, the soil type - Calcic Luvisols (23). According to values of pH (H₂O) the studied soil samples were characterized with neutral to

alkaline reaction. Alkaline reaction was mainly due to the presence of carbonates in the surface horizon. Humidity during flowering and fruiting is moderate. Invasive and competing plants have not been established.

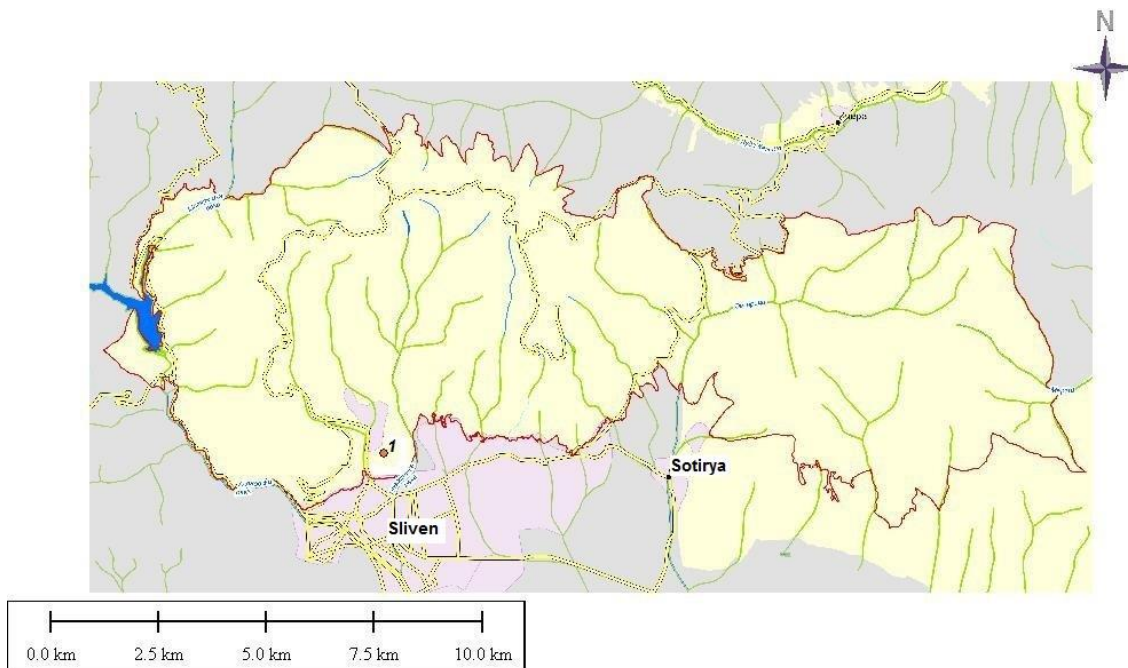


Figure 1. Distribution of *Anemone sylvestris* in Sinite kamani Natural park. 1- Gagovets area.

The first spot has an area of 960 m². During flowering 74 flowering and 34 juvenile specimens have been registered. The second spot has an area of 5 m² and includes 3 flowering specimens. The third spot has an area of 23 m². There are 14 flowering and 18 juvenile specimens. All plants are in good condition, but the population is endangered by anthropogenic impact since Gagovets area is adjacent to the town of Sliven and near the population there is a forest road. Major threat for the specimens is picking of flowers and/or eradication of whole plants. A serious danger for them is also trampling before reaching full maturity of seeds. Fouling of grass at the time of phenophase dropping of mature seeds hampers seed propagation.

Regardless of the very good condition of the population, due to the proven ornamental effect of the species and its limited distribution, both in-situ and ex-situ measures for its conservation should be taken. Assisting its natural seed and vegetative propagation and gradually increasing the area of the population in sections distant from the forest road will reduce the risk of

anthropogenic impact. Reproduction of the species in the park nursery under construction and the subsequent return of part of the plants grown in it to other habitats suitable for it, but away from the hiker's path will favour its preservation in the park.

Bromus moesiacus

The conducted studies established a population of the species along the road to the Lokvata area (**Figure 2**). The terrain is slightly sloped (2-4 °), slightly eroded, dry, facing south and elevation of 786 m a.s.l. The plants are located in a narrow strip along the road to Lokvata area. The geographic coordinates at the end and beginning of the population are: N 42° 44.631' E 26° 27.080'; N 42° 44.714' E 26° 26.339'. The area of the population is 451 m², and its number - 150 specimens. It has been visited during phenophases shaping of fruits and dropping of mature seeds. *Bromus moesiacus* is co-dominant with *Dactylis glomerata* L. in a herbaceous community incorporating *Hypericum perforatum* L., *Cynodon dactylon* (L.) Pers., *Mentha arvensis* L., *Agrimonia eupatoria* L., *Dorycnium herbaceum* Vill., *Achillea millefolium* compl.,

etc. There are single shrubs of *Rosa canina* L., *Crataegus monogyna* Jacq. and seedlings *Pinus nigra* A. F. Arnold. The parent material is marl, the soil type – Eutric Cambisols. Soil samples were characterized with acid reaction. Invasive and competing plant species have not been established. The majority of the plants are in a good condition. In some parts of the population signs of trampling and grazing have been observed. A threat to the natural reproduction of the species is the abundant overgrowth of grass

at the time of phenophase dropping of ripe fruit and in close proximity of the population to the road. Some of the ripe fruit do not reach the soil while another part fall on the road and do not develop. Having in mind the limited distribution of the species in the park territory it is necessary to facilitate the natural propagation of the species by placing insulating bags for collecting mature seeds and sowing them in appropriate, pre-cleaned portions of the population .

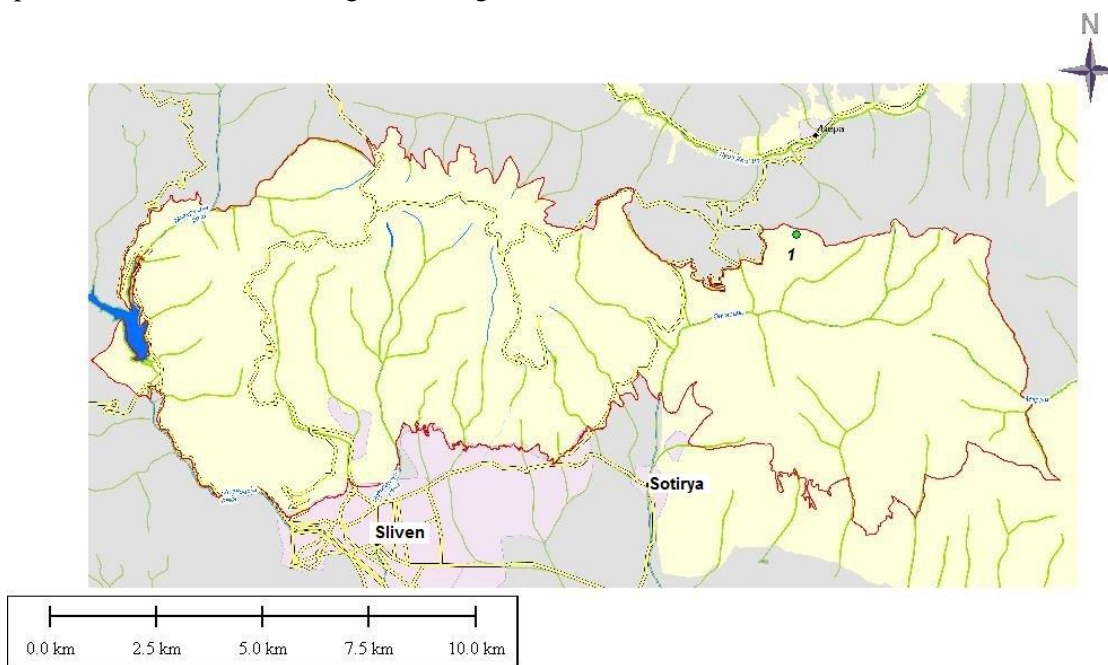


Figure 2. Distribution of *Bromus moesiacus* in Sinite kamani Natural park. 1- Lokvata area.

Cyclamen coum

During the studies 3 populations of the species have been found in the park (**Figure 3**). The most numerous is the population in the Ablanovo area. The terrain is slightly sloping (9°), non-eroded, facing west with an altitude 533-537 m a.s.l. The plants are placed into four groups and form a mottled structure. The geographical coordinates of the center of each of the four groups are : N $42^\circ 42.599'$ E $026^\circ 17.192'$; N $42^\circ 42.599'$ E $026^\circ 17.192'$; N $42^\circ 42.598'$ E $026^\circ 17.193'$; N $42^\circ 42.596'$ E $026^\circ 17.194'$. The population has an area of 27 m^2 and numbers 30 specimens. It was visited in phenophases blossoming, shaping of fruits, falling of mature seeds. *Cyclamen coum* is an asectatorial species in the herbaceous tier of a mixed deciduous forest incorporating *Quercus cerris* L., *Quercus robur* L. and *Carpinus orientalis* Mill. In the

herbaceous tier are registered *Ranunculus constantinopolitanus* d'Urv, *Viola alba* Besser, *V. odorata* L., *Scilla bifolia* L., etc. The parent material is marl, the soil type - Eutric Luvisols, the soil reaction was strong acid with values of pH less than 5. Humidity during flowering and fruiting is moderate. Invasive and competing plant species have not been found. The first group of plants numbers 11 specimens, including 7 flowering and 4 juvenile ones. The second group comprises 2 flowering specimens, and the third one - 3 flowering specimens. The fourth group comprises 14 specimens, of which 8 flowering and 6 juvenile ones. All plants are in good condition, but the population is endangered by human impact. Traces of the presence of humans and animals (horses) have been observed. Not far from its territory cuttings take place. A possible threat for the seed propagation

of the species is the abundant dead forest mat that prevents the fallen ripe seeds to reach the soil. Despite the welfare of the population, due to the proven ornamental value of the species and the registered anthropogenic presence it is necessary to take both in-situ, and ex-situ conservation measures. Facilitating its natural

reproduction by sowing with previously collected ripe seeds will increase its area and number. Seed propagation of the species in the nursery under construction in the park will help to stabilize the area and the number of this and the other populations in the park.

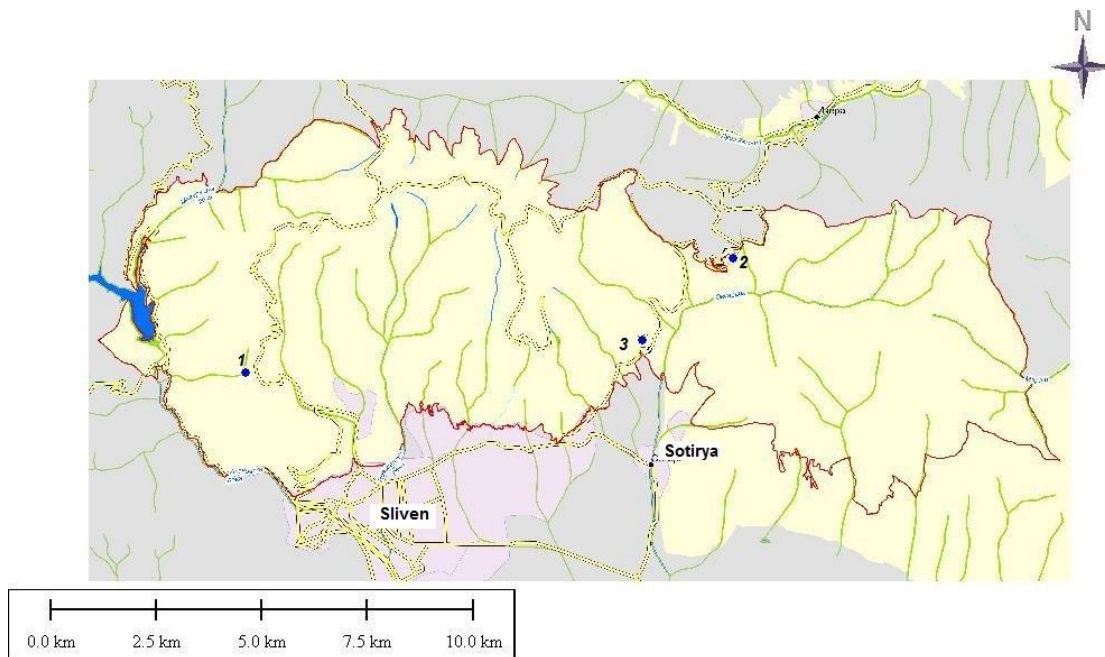


Figure 3. Distribution of *Cyclamen coum* in Sinite kamani Natural park. 1- Ablanavo area; 2- Chukata area; 3-after the area Enyova bulka.

The second established population of *Cyclamen coum* is from the Chukata area – opposite the fountain along the forest path. The terrain has a slope of 12°, slightly eroded, facing south with an altitude of 699-729 m a.s.l. The plants are in 3 groups. The geographic coordinates in the center of each group are: N 42° 44.207' E 26° 24.508'; N 42° 44.206' E 26° 25.509'; N 42° 44.203' E 26° 25.510'. The population has an area of 43 m² numbering 16 specimens. It has been visited phenophases blossoming, shaping of fruits, falling of mature seeds. *Cyclamen coum* is an asectatorial species in the herbaceous tier of a mixed deciduous forest incorporating *Acer pseudoplatanus* L., *Acer campestre* L., *Quercus robur* and *Carpinus orientalis*. There are single shrubs *Rosa canina* L., *Crataegus monogyna*. In the herbaceous tier are registered *Corydalis solida* (L.) Clairv., *C. marschaliana* Pers., *Viola odorata*. The parent material is limestone, the soil type – Regosols. The soil in that studied area was eroded with weak acid soil reaction.

Humidity during flowering and fruiting is moderate. Invasive and competing species have not been observed. The first group of plants numbers 7 specimens, including 3 flowering and 4 juvenile ones. The second group comprises 6 specimens - 3 flowering and 3 juvenile ones and the third one - 3 juvenile specimens. All plants are in good condition, but the population is endangered by human impact due to its immediate proximity to the main road Sliven - Karandila and a pathway. Traces of the presence of humans and animals (horses) have been observed. A major threat for the plants is trampling. Despite the early blossoming of the species, collection of flowers and/or eradication of whole plants is not excluded. A possible threat to the seed propagation of the species is the abundant dead forest mat that prevents seeds to reach the soil. Despite the relatively good condition of the population, due to the proven ornamental value of the species and the established anthropogenic impact it is necessary

to take measures to assist its natural reproduction - cleaning the dead forest mat near the fruiting plants, sowing mature seeds in sections of the population.

The third registered population of *Cyclamen coum* is after the area Enyova bulka, to the left of the first exit on the road. The terrain has a slope of 26°, heavily eroded, facing southwest and an altitude of 473-484 m a.s.l. The plants are in 3 groups spaced from one another. The geographic coordinates in the center of each group are: N 42° 42.914' E 26° 24.180'; N 42° 42.919' E 26° 24.179'; N 42° 44.918' E 26° 24.177'. The population has an area of 1475 m² and numbers 21 specimens. It was visited in phenophases blossoming, shaping of fruits, falling of mature seeds. *Cyclamen coum* is an asectatorial species in the herbaceous tier of a mixed deciduous forest incorporating *Quercus robur* and *Carpinus betulus* L. There are single shrubs of *Rosa canina*. In the herbaceous tier *Corydalis solida*, *Viola odorata*, *Scilla bifolia* L. have been registered. The parent material is limestone, the soil type - Eutric Luvisols. The soil samples were characterized with acid to neutral reaction. Humidity during flowering and fruiting is moderate. Invasive and competing species have not been established. The first group of plants comprises 8 specimens (3 flowering and 5 juvenile ones). The second group is of 7 specimens (3 flowering and 4 juvenile ones) and the third one - of 6 specimens (4 flowering and 2 juvenile ones). All plants are in relatively good condition, despite the active erosion processes. The population is threatened by anthropogenic impact - trampling, picking, uprooting, due to its proximity to the main road Sliven - Karandila. A possible threat to the seed propagation of the species is the abundant dead forest mat. Having in mind the existing threats and negative factors it is necessary to taken both in-situ and ex-situ measures to assist reproduction of the population and limiting the effect of the negative factors.

Quercus coccifera

During studies 2 populations of the species – in Ovcharnika area and Dalgia rid area have been found in the park (Figure 4). The first population observed was recorded by Tashev et al. (4). The terrain has a slope of 22-30°, highly eroded, dry, facing southeast, with an altitude of 850-855 m a.s.l. A total of 11 plants have been

registered, of which 3 visibly withered. The geographic coordinates in the center of the locality are N 42° E 26° 44.082' E 26° 17.287'. The drying plants coordinates are N 42° 44.127' E 26° 17.470'; N 42° 44.116' E 26° 17.454'; N 42° 44,114' E 26° 17,452'. The population has an area of 2100 m². The plant community is shrubby comprising *Fraxinus ornus*, *Quercus robur*, *Rosa canina*, *Cornus mas*. In the herbaceous tier dominate cereal species. Near the population there is a numerous population of *Pteridium aquilinum* (L.) Kuhn. The parent material is limestone, the soil type - Eutric Cambisols with acid reaction. Invasive species have not been observed. The consultations with a specialist entomologist and plant pathologist, as well as the data from our observations show that the main reason for withering of plants in the population are the ongoing erosion processes. A threat to specimens is *Pteridium aquilinum* reaching the border areas of the population. The close proximity of the population to the main road to Mt Bulgarka and Karandila does not exclude anthropogenic impact. It is imperative to take urgent measures to limit erosion by reinforcing the habitat with erosion control mesh, as well as mechanical control of *Pteridium aquilinum* along the border areas of the population.

The second established population of the species is in the Dalgia rid area. The terrain has a slope of 9°, slightly eroded, dry, with an altitude of 863 m a.s.l. Two plants have been registered. Their geographic coordinates are N 42° 43.306' E 26° 17.632'; N 42° 43.309' E 26° 17.616'. The population has an area of 25 m². The plant community comprises *Fraxinus ornus*, *Pinus nigra*, *Quercus robur*. In the herbaceous tier cereal species dominate. Both plants are located around the basal trunks of *Pinus nigra* trees. The first plant is on a slope facing south, and the second one - southeast. The parent material is quartz porphyry, the soil type - Eutric Cambisols with acid reaction with values of pH less than 6.0. Invasive species have not been observed. The origin of the locality is not clear. Due to the close proximity of the population to the main road to Mt Bulgarka and Karandila anthropogenic impact is not excluded. At this stage, despite the critically low number of the population, undertaking special measures for protection is not needed.

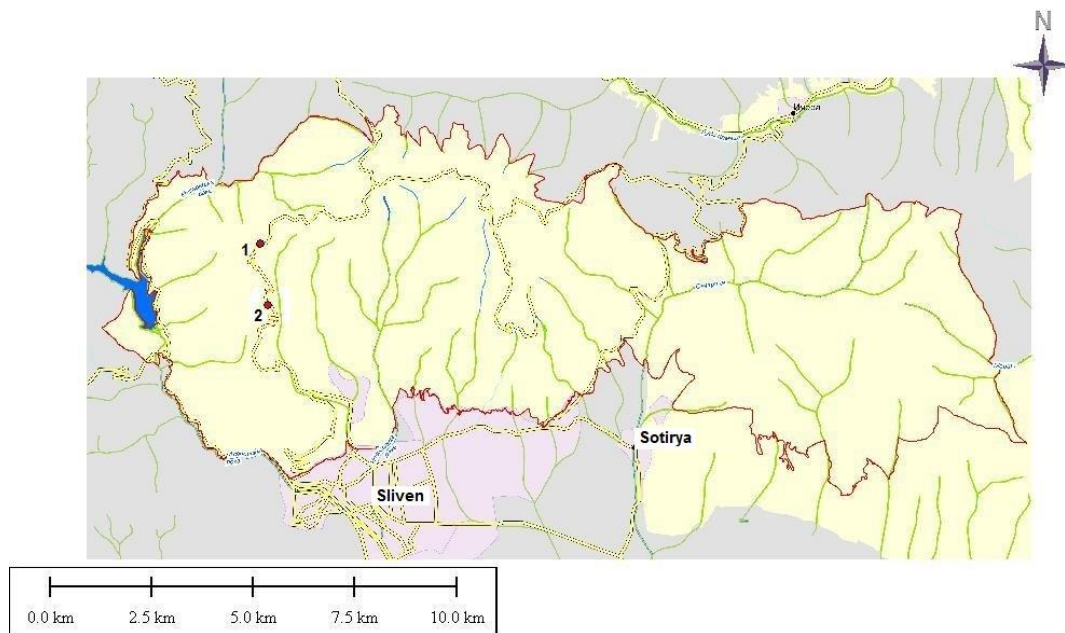


Figure 4. Distribution of *Quercus coccifera* in Sinite kamani Natural park. 1- Ovcharnিকা area; 2- Dalgia rid area.

CONCLUSION

Anemone sylvestris, *Bromus moesiacus*, *Cyclamen coum* and *Quercus coccifera* are part of the flora of “Sinite Kamani” Natural Park. One locality has been registered for the first two species. The *Anemone sylvestris* population has very good number, but because of the proven ornamental value of the species and the proximity of the population to the town of Sliven it is threatened by anthropogenic impact and it is imperative to undertake in-situ and ex-situ measures for its protection, as well as to seek an opportunity to transfer part of the specimens to a better protected place in the park. The population of *Bromus moesiacus* is the only one established in the last 32 years population of the species in the park. The condition of the specimens is good, but it is necessary to assist their natural propagation. The most numerous populations have been registered of *Cyclamen coum*. In all populations, anthropogenic impact has been observed and problems with the natural seed breeding of specimens have been registered. It is imperative to take in-situ and ex-situ measures for protection of the species. For *Quercus coccifera* the locality found by Tashev et al. (4) has been confirmed and a second locality has been registered in Dalgia rid area. For the population in Ovcharnিকা area intensive erosion processes have been found threatening the

existence of some of the specimens. The timely placement of an erosion control mesh would limit the processes and stabilize the condition of specimens. To preserve the species subject of this study, as well as of all endangered, rare and protected plants in the flora of “Sinite Kamani” Natural Park it is necessary to conduct systematic monitoring and in the case of negative impact to react immediately in order to save them.

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