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Biological diversity of forest ecosystem of the Basitchay State Nature Reserve

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The study analyzed the natural plant species of the Basitchay State Nature Reserve, located in the south of the Lesser Caucasus, Zangilan region, the population status of plants in the areas, the taxonomic composition of trees, shrubs, and grasses. For this purpose, the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan and the Institute of Dendrology of ANAS got acquainted with the current situation in the liberated area. During the monitoring, satellite images, GPS coordinates, etc. were used. Soil samples brought from the area were studied for 14 parameters of mineral content using Palintest soil kits 400 equipment. In the forest cover of the mountainous part, on dry rocky slopes, areas of natural distribution of plants are depicted. As a result, 27 species of trees, 18 shrubs, and 11 types of grass were recorded in the Basitchay State Nature Reserve. Of these species, 17 rare endangered trees, 3 shrubs, 3 types of grass, 6 trees and 2 shrubs of relict, and endemic species were identified.

Keywords: *Lesser Caucasus, the Basitchay State Nature Reserve, the condition of the population, relict and endemic species, rare species*

INTRODUCTION

Heydar Aliyev, who fought against the ecological terror policy of the Armenians when the plane-tree forest in Basitchay gorge was threatened with extinction since the 1950s, submitted a project to the Cabinet of Ministers in 1959 to create a reserve to protect the plane-tree forest. Due to the intervention of pro-Armenian officials, this project submitted by Azerbaijan was met with indifference. Armenians, who created a reserve in the Armenian part of the forest in 1960, took an active part in the deterioration of the territories belonging to the Azerbaijani side of the forest. The project submitted by Heydar Aliyev was supported by the decision of the Council of Ministers of the Azerbaijan SSR dated July 4, 1974, by transferring to the Basitchay State Nature Reserve 107 hectares of natural plane-tree forest on an area of 117 hectares located in the south of the Lesser Caucasus, Zangilan region. This is one of the greatest achievements of Heydar Aliyev in the fight against the environmental terror policy of Armenia.

The plane-tree forest in the Basitchay valley is a unique pearl that belongs not only to Azerbaijan but to all European nature. With the transfer of Zangazur to Armenia in the first years of Soviet rule in Azerbaijan, part of the plane-tree forest in the Basitchay valley - trees along the Khachin River and Shikhavuz river valleys - remained in Nerkin-Hand, Sav, and Shikhavuz villages of Gafan region. The atrocities committed by the depraved enemy have threatened to destroy the certified Eastern plane trees in the area. The Eastern plane tree (*Platanus orientalis* L.) is dominated in the Basitchay State Nature Reserve. There is a large number of 100-200 years old, 80-120 cm in diameter, and 25-30 meters high specimens.

MATERIALS AND METHODS

Analysis of natural plant species of Basitchay State Nature Reserve, the population status of plants in the areas, the taxonomic composition of trees, shrubs, and grasses were analyzed on the basis of (Grossheim, 1939), Engler and APG systems.

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The Diva-Gis system was used to obtain environmental parameters in the study area. Hypsometric height and area coordinates were measured by Garmin eTex 20 model GPS. During the monitoring, various literature from satellite images (Hajiyev and Musayev, 1996), T.Ibrahimov, 2010),) and internet data: (http: //www.anl.az›down›meqale›baki; https://imbb.az› news; http://bizimasr.media-az.com/arxiv_2002/ sent.09/208/sosium.html; http://bizimasr.media-az.com/arxiv_2002/sent.09/208/sosium.htm) was used.

The plane-tree forest, which is the object of research, the second in the world and the first in Europe, is protected in the Basitchay reserve. The name of the reserve is of Mongol origin and is named after the Beysut tribe. Plane forests in the Basitchay valley occupy 93.5% of the reserve. The territory of the reserve located in the Zangilan region is mainly mountainous, located at an altitude of 600-800 m above sea level. The right bank has steep slopes and the left bank consists of hills. The area has a temperate-hot climate with dry winters. Its territory consists of alluvial-forest soils, chestnut, gray-brown, grass-meadow soils with brown mountain-forest soils in the surrounding areas **(**Ibrahimov, 2010). It is characterized by geographical location, soil-climatic conditions, diversity of plant species in forests, and fertile soil.

RESULTS AND DISCUSSION

The main purpose of the study was to study the natural area of plant taxa of Basitchay State Nature Reserve, assess the ecological condition of the area, and determine the level of anthropogenic exposure.

For this purpose, the director of the Institute of Dendrology of ANAS, corresponding member of ANAS Tofig Mammadov together with the representatives of the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan got acquainted with the current condition of the liberated area. Satellite images, various data and GPS coordinates were used during the monitoring.

Natural *Amorpha fruticosa* L., *Platanus orientalis* L., 12-15 km along the Basitchay, which starts from the eastern slopes of the Zangazur range; (*Ananim, 1970*) in the north with xerophyte forest cover consisting of *Pistacia vera* L., *Mespilus germanica* L., *Celtis caucasica* Willd., *Rhamnus pallasii* Fisc. & C.A.Mey, *Paliurus spina-christi* Mill., *Crataegus monogyuna* Jacq. and others; to the south is a forest massif of *Quercus orientalis* and *Carpinus orientalis* Mill (Table 1).

During the monitoring, it was observed that the plane tree, which occupies the first tier of the forest in the area, was mixed with ordinary walnut (*Juglans regia* L.). *Celtis caucasica* was found in the second tier, and poplar (*Populus* L.), elm (*Ulmus* L.), and long-stemmed oak (*Quercus longipes* L.) were found along the river. The taxonomic composition of trees, shrubs, and grasses of the area is grouped and reflected in Tables 1 and (Mammadov et al., 2016).

Relict and endemic plant species were also studied in the area and a total of 7 species were identified - 5 trees and 2 shrubs (Table 2).

Table 1. Taxonomic composition of tree plants in Basitchay State Nature Reserve

In the forest cover of the mountainous part	**On dry rocky slopes**	**At altitudes from 800 m to 1400 m, in the massif of Surtun**
1. *Platanus orientalis* L.	1. *Quercus araxina* Grossh.	1. *Amygdalus fenzliana* Lipsky
2. *Quercus iberica* M.Bieb.	2. *Celtis caucasica* Willd.	2. *Amygdalis narica* Fed.et
3. *Juglans regia* L.	3. *Carpinus orientalis* Mill.	3. *Diospyros lotus* L.
4. *Celtis caucasica* Willd.	4. *Pyrus boissieriana* Buhse	4. *Juniperus foetidissima* Willd.
5. *Morus nigra* L.	5. *Acer iberica*	5. *Juniperus polycarpos* K.Koch.
6. *Carpinus caucasica* Grossh.	6. *Ulmus araxina* Tacht.	6. *Taxus baccata* L.
7. *Salix* L.	7. *Pyrus salicifolia* Pall.	7. *Corylus colurna* L.
8. *Juniperus* communis L.	8. *Juniperus foetidissima* Willd.	8. *Quercus longipes* Steven
9. *Pistacia mutica* Rech.f.	9. *Elagnus orientalis* L.	
10. *Populus* L.		

As a result of the monitoring, 10 species were identified in the forest cover of the mountainous part of the Basitchay State Nature Reserve, 9 on dry rocky slopes, and 8 species in the Surtun massif at altitudes from 800 m to 1400 m.

Relict, endemic rare, and endangered plants were also studied, grouped, and tabulated in the Basitchay Reserve. 17 rare and endangered trees, 6 shrubs, and grasses were observed in the reserve (Table 3, 4) (Salaev, 1991).

Table 2. Relict, endemic trees, shrubs, and grasses of Basitchay State Nature Reserve.

Trees
1. *Platanus orientalis* L.
2. *Pterocarya pterocarpa* Kunth ex I. Iljinsk.
3. *Corylus colurna* L.
4. *Juniperus foetidissima* Willd.
5. *Diospyros lotus* L.
Shrubs
1. *Punica granatum* L.
2. *Crataes eriantha* A. Pojarк.

Table 3. Taxonomic composition of shrubs and grasses of the reserve

Shrubs (18)
Paliurus spina-christi Mill.
Sambucus ebulus L.
Punica granatum L.
Cotoneaster integerrimus Medik.
Cotoneaster melanocarpus Fisch. ex A.Blytt
Rhamnus pallasii Fisch. & C.A. Mey.
Berberis densiflora Boiss. & Buhse
Rosa sachokiana P. Jarosch.
Jasminum fruticans L.
Crataegus eriantha A. Pojarк.
Atraphaxis spinosa L.
Mespilus germanica L.
Pyracantha coccinea M.Roem
Spiraea sp.
Ephedra intermedia Schrenk. Et. C.A.Mey.
Cerasus microcarpa (C.A. Mey.) Boiss.
Lonicera iberica M.Bieb.
Myriacaria squamosa Desv.
Herbaceous plants (12)
Iris paradoxa Steven.
Andropogon sp.
Teucrium sp.
Thymus sp.
Xeranthemum sp.
Stellaria media (L.) Vill.
Poa annua L.
Geranium molle L.
Urtica dioica L.
Taraxacum vulgare Schrank
Crocus adamii J.Gay
Ophrys caucasica Woronow ex Grossh.

Table 4. Rare and endangered trees, shrubs, and grasses of Basitchay State Nature Reserve.

Rare and endangered tree plants
1. *Juglans regia* L.
2. *Quercus iberica*
3. *Celtis caucasica* Willd.
4. *Corylus colurna* L.
5. *Salix caucasica* Anderss
6. *Taxus baccata* L.
7. *Pistacia mutica*
8. *Populus nigra* L.
9. *Pyrus boissieriana* Buhse
10. *Quercus araxina* Grossh.
11. *Pyrus salicifolia* Pal.
12. *Amygdalis narica* Fed.et
13. *Acer ibericum* M.Bieb
14. *Juniperus foetidissima* Willd.
15. *Amygdalus fenzliana* Lipsky
16. *Taxus baccata* L.
17. *Quercus longipes* Steven
Rare and endangered grasses and shrubs
1. *Pyracantha coccinea* M.Roem
2. *Rosa sachokiana* P. Jarosch.
3. *Atraphaxis spinosa* L.
4. *Ophrys caucasica* Woronow ex Grossh.
5. *Crocus adamii* J.Gay
6. *Iris paradoxa* Steven.

As a result of the monitoring, *Platanus orientalis* L., *Taxus baccata* L., *Corylus colurna* L., *Quercus arachnid* Grossh. were found in the area., *Pterocarya pterocarpa* Kunth ex I.Iljinsk., *Celtis caucasica*, *Pyrus boissieriana* Buhse., *Pyrus salicifolia* Pal. Along with rare and endangered relict species such as *Pistacia mutica*, *Diospyros lotus* L., *Punica granatum* L., *Vitis sylvestris*, *Morus nigra*, *Elagnus orientalis* species have been identified as endangered as a result of the abominable actions of Armenians (Ananim, 1989). 5 species listed in the Red Book in the reserve - *Platanus oriaentalis* L., *Pyracantha coccinea* M. Roem. (Mammadov T.S. 2016). *Iris paradoxa* Steven. *Crocus adami* J.Gay., *Ophrys caucasica* Woronow observed (Fig.1). The soil sample brought from the territory of Basitchay State Nature Reserve by the Institute of Dendrology of ANAS was analyzed with Palintest Soil equipment. (Hajiyev and Musayev, 1996). The soil sample brought to the "Plant Ecology" laboratory of the Institute was studied with 14 parameters according to the mineral content by means of "Palintest soil kits 400" equipment (Fig. 2). The results are shown in Table 5.

Table 5. Results of the analysis of the soil sample brought from Zangilan-Basitshay State Nature Reserve.

EXAMPLE	Depth (sm)	pH	Electric conductiv. m/ms	NO_3^-	K^+	NH_4^+	Cu^{2+}	Mg^{2+}	SO_4^{2-}	$P_2O_5^{3-}$	Ca^{2+}	Cl^-	Al^{3+}	Fe^{2+}	Mn^{2+}
	Standard	7	-	0-25 µg /l	0-450 µg /l	0-75 µg /l	0-25 µg /l	0-500 µg /l	0-300 µg /l	0-150 µg /l	0-250 µg /l	0-1000 µg /l	0-50 µg /l	0-25 µg /l	0-25 µg /l
Roadside	10-25	7.8	520	>>	350	<<	7.0	120	65	49	4250	2375	0.8	4.2	<<
Riverside	10-25	7.1	920	27.0	360	0.5	18.4	370	65	0	3750	2250	<<	21.8	0.0

Pyracantha coccinea M.Roem.

Iris paradoxa Steven.

Crocus adami J.Gay.

Ophrys caucasica Woronow ex Grossh.

Fig. 1. Species included in the Red Book of the reserve

Fig. 2. Analysis of soil sample brought from Basitchay State Nature Reserve in the laboratory with Palintest Soil equipment

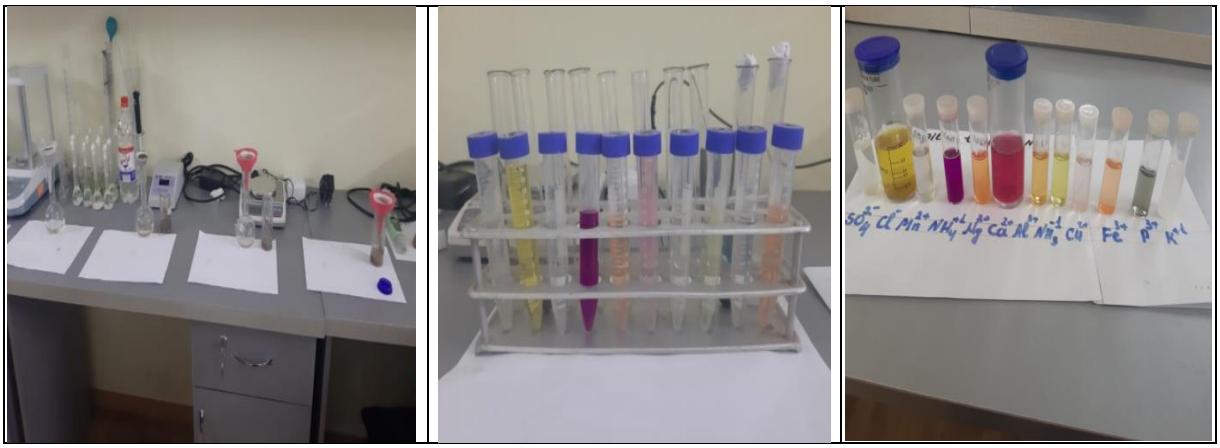

Fig. 3. View of analysis of 14 parameters according to mineral content with "Palintest soil kits 400" equipment.

The first soil sample is taken from the reserve area on March 6, 2021, from a depth of 10-25 cm in a medium-yield area, the analysis revealed that the soil pH was weakly alkaline, electrical conductivity was 520 cm/mS, contains metal ions. There is a lot of nitrate-nitrogen (NO_3), which indicates that nitrogen bacteria are active in the soil (Fig.3). Potassium ions are present in the area (K^+) at 350 mg / g, confirming the low water holding capacity of the soil. If you look at the ammonium ion (NH^{+4}) in the soil, almost no organic fertilizer was applied to the area. In the example, copper ions (Cu^{2+}) are about 3 times higher than the standard value, the area that belongs to the pasture. Magnesium ions (Mg^{2+}), on the other hand, are 2 times lower than the standard, sulfur ions (SO_4^{2-}), and phosphorus ($P_2O_5^{3-}$) ions are 3 times lower than the standard. These indicators show that mineral fertilizers have not been applied to the soil for a long time

In this example, Ca^{2+} salts and chloride salts 3 times higher than the standard confirms that the area is moderately saline. Aluminum ion is only 0.8 mg/g, iron ion (Fe^{2+}) is very small, manganese ion (Mn^{2+}) is completely absent. According to the above-mentioned analytical analyzes, the application of organic and mineral fertilizers to such lands can allow obtaining productivity.

The second example is coastal soils with a pH of 7.1, ie a neutral environment. This proves that the area is constantly washed away by water. Due to the leaching of organic and mineral elements from the soil, the electrical conductivity is high due to heavy metal ions - 920 cm/mS, nitrate nitrogen is only 27.0 mg/g, potassium ions (K^+) 360 mg/g, which indicates poor soil moisture capacity. Lack of organic fertilizer in the soil, copper ions, magnesium ions below the standard, 5 times the sulfur

compounds, the absence of phosphorus ions confirms that the soil is unsuitable for cultivation. The content of calcium and chloride ions in these soils is higher than the standard and is significantly saline. Aluminum and manganese ions were not found in the sample, and iron ions were close to the standard. It is not expedient to select such lands as arable lands (Salaev, 1991).

During the monitoring of Basitchay State Nature Reserve located in the Zangilan region, 27 trees, 18 shrubs, and 11 grass species were registered, of which 18 trees, 3 shrubs, 3 grass species are rare and 5 endangered trees and 2 shrubs are relict and endemic plants (Table 6, 7).

Table 6. Rare and endangered plants.

Plants	Number of species
Tree plants	17
Grasses and shrubs	6
Relict and endemic	7

Table 7. Area of distribution of tree plants in the territory of the reserve.

Place	Number of species
Of the mountainous part in the forest cover	**10**
On dry rocky slopes	**9**
At an altitude of 800 m to 1400 m, in the Surtun massive	**9**

The damage caused to the ecology and natural resources of Azerbaijan as a result of the occupation of our territories by Armenia is immeasurable. Karabakh's natural resources, especially plant resources, have been ruthlessly looted by Armenians. They are the most looted forests after the gold extracted from our occupied lands for 30 years. Trees were cut down and destroyed in a part of the Chinar forest in the Basitchay State Nature Reserve. Red oak trees were uprooted and cut down, furniture was produced and most of them were sold to foreign countries. The reserve was looted by Armenians and threatened to completely destroy the vegetation in the area. All this is the terrorist damage inflicted on nature, natural monuments and the environment as a whole by Armenians.

CONCLUSIONS

Eastern plane trees were cut down, various explosives were used to destroy the roots of the broken trees, and fires broke out in the area, which led to the destruction of the reserve. As a result of monitoring, in the forest cover of the mountainous part of the area, *Quercus iberica* and *Carpinus caucasica*, 2 species of *J. foetidissima*, *Juniperus depressa* Stev. and *Pistacia mutica*, walnut, hackberries, mulberry, willow, poplar, hawthorn, rosa, buckthorn, dry-steppe, mountain xerophilous plants, shrubs, blackthorn, etc. found.

On dry rocky slopes *Q. araxina*, *Celtis caucasica* Willd., *C. orentalis*, *P. mutica*, *Acer iberica*, *Ulmus araxina*, *Pyrus salicifolia* forms sparse forests with juniper. These forests include xerophytic shrubs: *Atraphaxis spinosa*, *Lonicera iberica*, *Cerasus microcarpa*, *Ephedra intermedia* Schrenk. Et. C.A.May., *Jasminum fruyicans*, *Rhamnus pallasii* and *Paliurus spina-christi* are naturally distributed.

In general, as a result of monitoring, 27 species of trees, 18 shrubs and 11 species of grasses were registered in the Basitchay State Nature Reserve. Of these, 17 trees, 3 shrubs, 3 grass species were identified as rare and endangered plants, and 6 trees and 2 shrubs were identified as relict and endemic plants.

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Bəsitçay Dövlət Təbiət Qoruğunun meşə ekosisteminin bioloji müxtəlifliyi

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Tədqiqat zamanı Kiçik Qafqazın cənubunda, Zəngilan rayonu ərazisində yerləşən Bəsitçay Dövlət Təbiət Qoruğunun təbii bitki növlərinin təhlili, areallarda bitkilərin populyasiya vəziyyəti, ağac, kol və ot bitkilərinin taksonomik tərkibi araşdırılmışdır. Bu məqsədlə AR Ekologiya və Təbii Sərvətlər Nazirliyi və AMEA Dendrologiya İnstitutu birgə işğaldan azad olunmuş ərazinin mövcud vəziyyəti ilə tanış olmuşlar. Monitorinqlər zamanı peyk görüntülərindən, GPS kordinatlardan və s. istifadə edilmişdir. Ərazidən gətirilmiş torpaq nümunələri "Palintest soil kıts 400" avadanlığı vasitəsilə 14 parametrlə mineral tərkibə görə öyrənilmişdir. Ərazinin dağlıq hissəsinin meşə örtüyündə, quru daşlı yamaclarda təbii halda yayılan bitkilər təsvir edilmişdir. Nəticədə Bəsitçay Dövlət Təbiət Qoruğunda 27 növ ağac, 18 növ kol və 11 növ ot bitkisi qeydə alınmışdır. Bu növlərdən nadir və nəsli kəsilməkdə olan 17 ağac, 3 kol, 3 ot bitkiləri, relikt və endemik növlərdən isə 6 ağac, 2 kol bitkisi müəyyən olunmuşdur.

Acar sözlər: *Kiçik Qafqaz, Bəsitçay Dövlət Təbiət Qoruğu, populyasiya vəziyyəti, relikt və endemik növlər, nadir növlər*

Биологическое разнообразие лесной экосистемы Баситчайского государственного природного заповедника

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В ходе исследования проанализированы естественные виды растений, популяционный статус, таксономический состав деревьев, кустарников и трав на территории Баситчайского государственного природного заповедника, расположенного на юге Малого Кавказа, в Зангиланском районе. С этой целью Министерство экологии и природных ресурсов Азербайджанской Республики и Институт дендрологии НАНА ознакомились с текущей ситуацией на освобожденной территории. При мониторинге использовались спутниковые снимки, координаты GPS и др. Привезенные с территории пробы почвы были исследованы по 14 параметрам минеральности с помощью оборудования Palintest soil kits 400. В лесном покрове горной части участка сухих каменистых склонов наблюдается естественное распространение растений. В результате в Баситчайском государственном заповеднике зарегистрировано 27 видов деревьев, 18 кустарников и 11 видов трав. Из этих видов выявлено 17 редких исчезающих деревьев, 3 кустарника, 3 вида трав, 6 деревьев и 2 куста реликтовых и эндемичных видов.

Ключевые слова: *Малый Кавказ, Баситчайский государственный природный заповедник, состояние популяции, реликтовые и эндемичные виды, редкие виды*