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Floristic diversity of forest massives of Gabala district (Azerbaijan) and state of populations of rare species

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Abstract: The article presents the results of a study of forests in the Gabala district. As a result of taxonomic analysis, 235 taxa united in 4 divisions, 5 classes, 28 orders, 58 families and 161 genera were found to grow in the study area. Among the studied taxa, 17 endemics of the Caucasus, one endemic of Azerbaijan and 12 rare and endangered species were identified. According to their life forms, 185 taxa are herbaceous, 50 - woody and semi-woody forms. Of the total number (235) species growing in the forests of Gabala district, 164 species are medicinal, 29 - food, 52 - decorative, 10 - dyeing, 13 - technical. Study of the ontogenetic and demographic structure of coenopopulations (CP) of rare and vulnerable taxa *Platanthera chlorantha* (CP 1, CP 2), *Listera ovata* (CP 3, CP 4), *Cephalanthera rubra* (CP 5, CP 6), *Dactylorhiza romana* subsp. *georgica* (CP 7), *Epipactis palustris* (CP 8) showed that all CPs are normal, however, due to the absence of senile and subsenile individuals, they are incomplete (with the exception of CP 1). According to the indices Δ and ω CP 1, CP 4, CP 7 are young, and CP 2, CP 3, CP 5, CP 6 and CP 8 - mature.

Keywords: *flora, economically important plants, endemics, life forms, rare and vulnerable species*

INTRODUCTION

In recent years, a lot of work has been done in the districts of the republic in the direction of intensification of economic and economic activity, expansion of infrastructure and tourism network. However, the works carried out did not pass without a negative impact on the nature of these districts, especially on its vegetation. The activities of numerous tourism and recreational facilities built in the districts, mainly in forest areas, and the mass flow of people keep these forests in a constant state of stress. This gradually leads to the degradation of forests, the narrowing and destruction of the habitats of more sensitive plant species.

All these processes are especially noticeable in Gabala district of the Republic, because its relative proximity to the city of Baku causes a large influx of tourists. Therefore, today there is an urgent need to assess the health status of Gabala's forest massifs. As one of the steps taken in the direction of such an assessment, the study of the floristic diversity of the forest massifs of Gabala district was set as the goal, and a relevant research was conducted by us in this direction [National Strategy and Action Plan for the protection and sustainable use of biological diversity in the Republic of Azerbaijan, 2015]. Meanwhile, forest ecosystems were monitored, economically important species were discovered, as well as coenopopulations of some rare and more endangered species were studied and their current status was assessed.

MATERIAL AND METHODS

Gabala district of Azerbaijan is located in the north-western part of the country, bordering with the Russian Federation, mainly in mountainous areas. Bazarduzu (4456 m), the highest mountain peak of the Greater Caucasus, as well as Tufandag (4206 m), Bazaryurd (41216 m) and other high mountain peaks are located in the territory of this district. Demiraparan, Vandam, Bum, Tikanlı, Hamzali and other mountain rivers flowing in the territory of the district create a fairly wide river network.

A very complex and sharp change of relief conditions in the area along the vertical belt has led to the formation of different climate types. Thus, the area has semi-desert, dry steppe cold and mountainous tundra climate types. The annual average temperature of the air in Gabala district is 10.6°C, the average amount of precipitation - 1027 mm, the relative humidity of the air - 76%, and the evaporation - 680 mm. The average annual temperature of the soil surface is 13-15°C.

Existing natural-geographical features caused the formation of rich vegetation, including large forest massifs, in the district. The total area of forests in the district reaches approximately 60,000 hectares, which is 23% of the entire area of district. This is 2 times more

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than the same indicator for Azerbaijan in general.

Field studies were conducted in Gabala State Nature Reserve, forest massifs around the villages of Yengija, Bunud, Gamarvan, Nohurgishlaq, Boyuk Pirali, Laza, Vandam, Bum, Duruja, Tuntul, Hamzalli from 700 m to 1800 m above sea level by the route-reconnaissance method in April-September.

In order to detect and protect populations of rare species, coenopopulations (CP) of a number of rare [Red Book ..., 2013] and sensitive species found in this district were studied. *Platanthera chlorantha* (Custer) Rchb. (CP 1, CP 2), *Listera ovata* (L.) R. Br. (CP 3, CP 4), *Cephalanthera rubra* (L.) L. C. Rich. (CP 5, CP 6), *Dactylorhiza romana* subsp. *georgica* (Klinge) Soo ex Renz et Taubenheim (CP 7), *Epipactis palustris* (L.) Crantz . (CP 8) taxa were selected as the research object [Fig. 1].

Description of vegetation and phytocenosis was carried out by generally accepted geobotanical methods [Field geobotany, 1974]. During the study of the ontogenetic and demographic structure of coenopopulations, the principles and methods of Uranov and followers of this school were used [Uranov, 1975; Zlobin et al., 2013]. The ontogenetic spectrum was determined based on the demographic parameters of the coenopopulation. In order to study the individuals and ontogenetic structure of the coenopopulations of the species, 10-15 small plots (1 m^2) were placed in the model plots (10 m^2). The total number of individuals in the plots and the total number of individuals in each age group were calculated. The type of coenopopulation was determined based on Zhivotovsky's Δ–ω (delta–omega) classification of a normal population [Zhivotovsky, 2001]. World flora online [http://www.worldfloraonline.org. Accessed on: 28 Nov 2022'] database was used to determine the taxonomic status of the species involved in the coenosis.

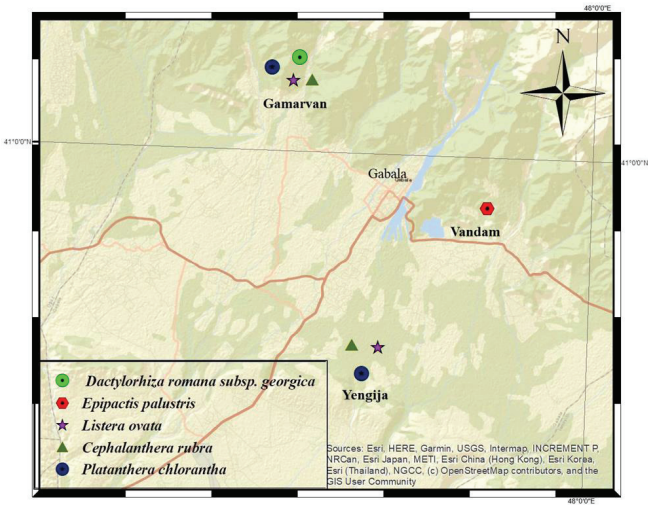

Figure 1. Cenopopulations of rare species revealed in forest of Gabala district.

RESULTS AND DISCUSSION

The monitoring of the forests of the Gabala district made it possible to identify the species composition of plants and characterize the flora. As a result of the taxonomic analysis, it was found that 235 taxa united in 4 divisions, 5 classes, 28 orders, 58 families and 161 genera grow in the forests of Gabala district (Tab. 1).

Table 1. Quantitative distribution of species by divisions, classes and orders.

Divisions, classes and orders	Family		Genus		Species	
	number	%	number	%	number	%
Equisetophyta	1	1.72	1	0.62	1	0.43
Equisetopsida	1	1.72	1	0.62	1	0.43
Equisetales	1	1.72	1	0.62	1	0.43
Polypodiophyta	3	5.2	3	1.86	4	1.70
Polypodiopsida	3	5.2	3	1.86	4	1.70
Polypodiales	3	5.2	3	1.86	4	1.70
Pinophyta	2	3.4	2	1.24	2	0.85
Pinopsida	2	3.4	2	1.24	2	0.85
Cupressales	2	3.4	2	1.24	2	0.85
Magnoliophyta	52	89.7	155	96.3	228	97.02
Magnoliopsida	44	75.9	137	85.1	198	84.26
Apiales	2	3.4	7	4.34	7	2.98
Asterales	1	1.72	18	11.18	23	9.78
Boraginales	1	1.72	5	3.1	6	2.55
Brassicales	1	1.72	4	2.48	4	1.70
Caryophyllales	4	6.9	10	6.2	18	7.66
Cornales	1	1.72	2	1.24	2	0.85
Dipsacales	2	3.4	4	2.48	9	3.83
Ericales	1	1.72	1	0.62	2	0.85
Fabales	1	1.72	8	4.9	13	5.53
Fagales	2	3.4	3	1.86	9	3.83
Gentianales	2	3.4	2	1.24	3	1.28
Geraniales	1	1.72	1	0.62	4	1.70
Lamiales	6	10.3	19		33	14.04
Malpighiales	4	6.9	4	2.48	10	4.26
Malvales	1	1.72	2	1.24	2	0.85
Myrtales	1	1.72	3	1.86	3	1.28
Ranunculales	2	3.4	5	3.1	10	4.26
Rosales	4	6.9	16		26	11.06
Sapindales	2	3.4	2	1.24	5	2.13
Saxifragales	1	1.72	1	0.62	3	1.28
Solanales	2	3.4	5	3.1	6	2.55
Liliopsida	8	13.8	22	13.7	30	12.76
Alismatales	2	3.4	2	1.24	2	0.85
Asparagales	3		12	7.45	16	6.80
Liliales	1	1.72	1	0.62	1	0.43
Poales	2	3.4	9	5.6	11	4.68
Total:	**58**	**100**	**161**	**100**	**235**	**100**

The vast majority of species belong to the *Magnoliophyta division* - 228 species (97.02%). The divisions *Equisetophyta*, *Polypodiophyta* and *Pinophyta*

are represented by only 1–4 species (0.43–1.70%). A similar picture is observed in relation to families and genera, so in the division *Magnoliophyta*, respectively, 52 (89.7%) and 155 (96.3%), in other divisions from 1 to 3 families (1.7-5.2%) and genera (0.6-1.86 %).

The division *Magnoliophyta* is dominated by representatives of the class *Magnoliopsida* (44 families, 137 genera, 199 species), in which the largest number of genera and species are distinguished by families *Rosaceae* Juss. (respectively, 14 and 22) and *Asteraceae* Giseke, (respectively, 17 and 21). A somewhat smaller number of genera and species is noted in the families *Lamiaceae* Martinov, *Fabaceae* Juss., *Scrophulariaceae* Juss, containing a total of 36 species from 22 genera. The families *Caprifoliaceae* Juss., *Caryophyllacedae* Juss., *Apiaceae* Lindl., *Boraginaceae* Juss., *Polygonaceae* Juss., *Ranunculaceae* Juss. and *Convolvulaceae* Juss. include 5-7 species from 29 genera. Families representing 4 species - *Betulaceae* Gray, *Brassicaceae*, *Euphorbiaceae* Juss., *Fagaceae* Dumort., *Geraniaceae* L. (*Sorbus caucasiica* Zins., *S. caucasigena* Kom., *S. graeca* (Spach) Hedl., *S. torminalis* (L.) Crantz), *Stachys* L. (*Stachys atherocalyx* K. Koch , *S. byzantina* K. Koch, *S. macrantha* K. Koch, *S. sylvatica* L.), *Trifolium* L. (*T. campestre* Schreb., *T. media* L., *T. pretense* L., *T. tumens* Stev.), *Veronica* L. (*Veronica caucasica* M. Bieb., *V. crista-galli* Steven, *V. officinalis* L., *V. serpyllifolia* L.). Genera containing three species: *Lonicera* L. (*Lonicera caprifolium* L., *L. caucasica* Pall., *L. iberica* M. Bieb.), *Plantago* L. (*Plantago lanceolata* L., *P. major* L., *P. media* L.), *Quercus* L. (*Quercus macranthera* Fisch. et C.A. Mey., *Q. petraea* subsp. *polycarpa* (Schur) Raus, *Q. robur* subsp. *pedunculiflora* (K. Koch) Menitsky), *Salvia* L. (*Salvia verbascifolia* M. Bieb., *S. verbascifolia* M. Bieb., *S. verticillata* L.), *Sedum* Adans. (*Sedum hispanicum* L., *S. pallidum* M. Bieb.), *Viola* L. (*Viola alba* Besser, *V. arvensis* Murray, *V. sieheana* W. Becker). 37 genera (*Achillea* L., *Ajuga* L., *Echium* L., *Rosa* L., *Silene* L., *Tanacetum* L., *Ulmus* L., *Valeriana* L., etc.) represent 2 species each, the remaining 114 genera, 1

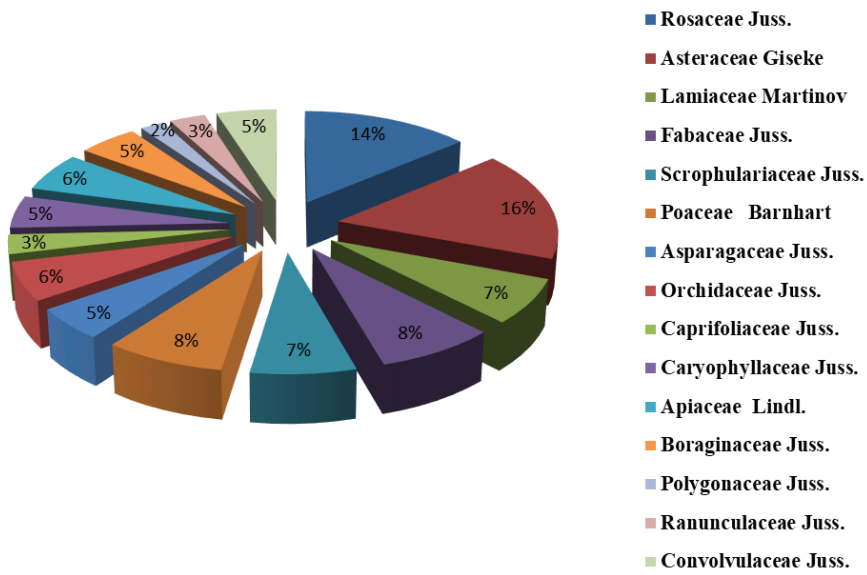

Figure 2. Quantitative distribution of genera in leading families.

Juss., *Sapindaceae* Juss. The remaining 40 families include 1-3 taxa (Fig. 2).

Genera, including four species: *Acer* L. (*Acer campestre* L., *A. laetum* C.A. Mey., *A. trautveteri* Medw., *A. velutinum* Boiss.), *Euphorbia* L. (*Euphorbia condylocarpa* M. Bieb., *E. helioscopia* L., *E. squamosa* Willd., *E. stricta* L.), *Geranium* L. (*Geranium albanum* M. Bieb., *G. columbinum* L., *G. ibericum* Cav., *G. robertianum* L.), *Rumex* L. (*Rumex acetosa* L., *R. crispus* L., *R. sanguineus* L., *R. obtusifolius* L.), *Sorbus* species each (Fig. 3).

The leading families of the class *Liliopsida*, including from 7 to 10 species, are the families *Poaceae* Barnhart (8 genera, 10 species), *Asparagaceae* Juss. (5 genera, 7 species) and *Orchidaceae* Juss. (6 genera, 7 species). The remaining 5 families, such as *Alismataceae* Vent., *Araceae* Juss., *Iridaceae* Juss., *Smilacaceae* Vent. and *Juncaceae* Juss. represented by 1 genus and 1 species. Genera *Asparagus* L., *Cephalanthera* Rich, *Bromus* L. and *Poa* L. include 2 species each - *Asparagus officinalis*

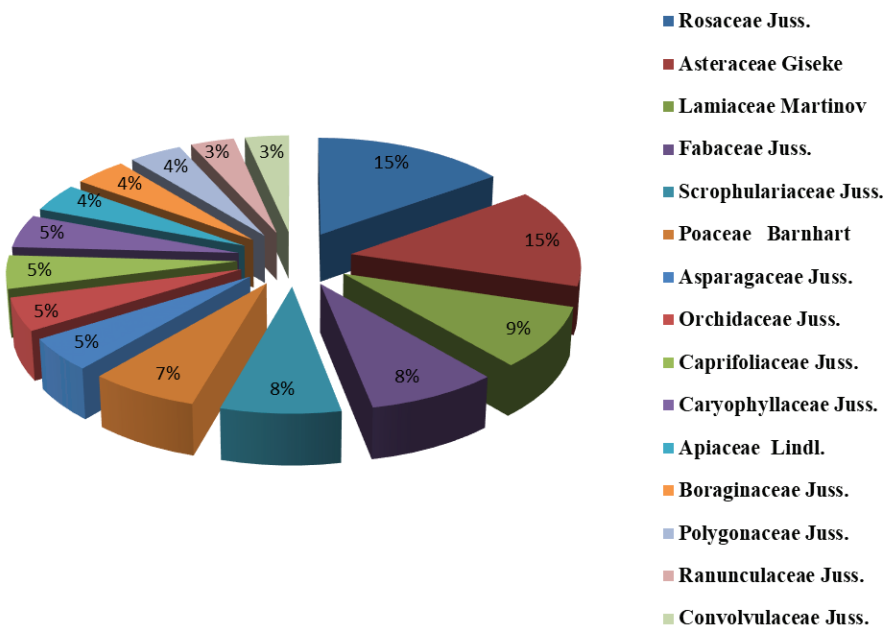

Figure 3. Quantitative distribution of species in leading families.

L., *A. verticillatus* L., *Polygonatum glaberrimum* K. Koch, *P. polyanthemum* (M.B.) Dietrich, *Cephalanthera longifolia* (L.) Fritsch, *C. rubra* (L.) Rich., *Bromus mollis* L., *B.* (Huds.) Bieb., *Poa nemoralis* L., *P. trivialis* L.

Analysis of life forms (ecobiomorphs) of plants according to the system of I.G. Serebryakova (1964) showed that their biological spectrum is quite wide and diverse (Fig. 4).

As can be seen from figure 4 most of the species belong to herbs. 185 species make up herbaceous plants, among which perennials dominate (135 species). Annual and biennial grasses are represented by a significantly smaller number of taxa (28 and 5, respectively), the number of species with intermediate life forms, such as annual/biennial, biennial/perennial, perennial/biennial, and annual/biennial/perennial, varies from 1 to 11 (respectively) 11, 4, 1, 1). The structure of herbaceous plants is different. Rhizome species dominate (species -%), which make up a significant part of the species composition. Taprooted (76 species, 32.3%) and short-

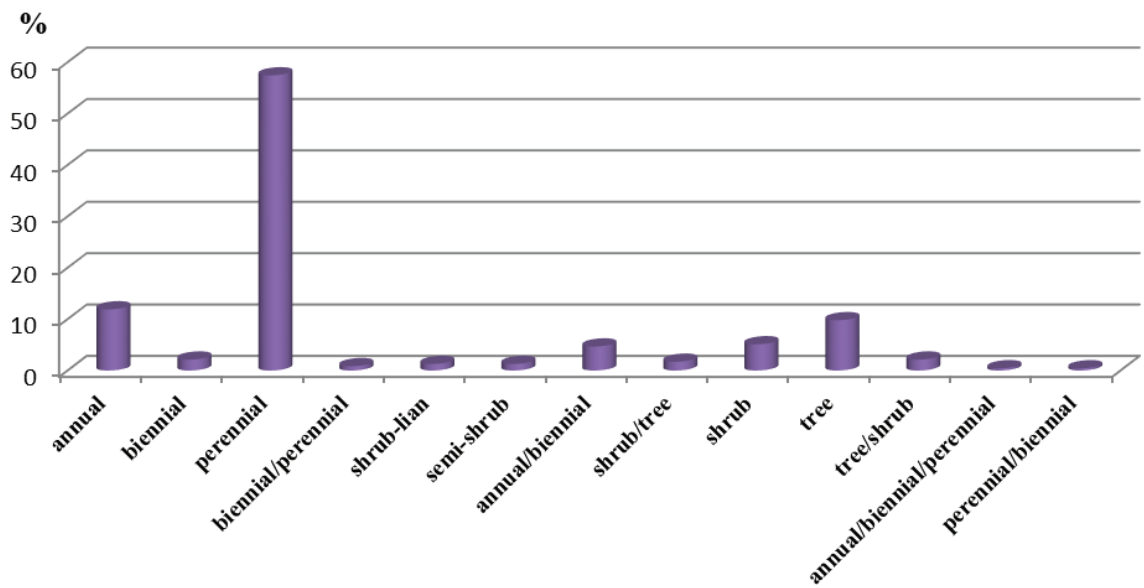

Figure 4. The ratio of life forms (according to I.G. Serebryakov) revealed in forest of Gabala district.

rooted (59 species, 25.1%) dominate, constituting a significant part of the species composition. Long-rhizomatous (23 species - 9.8%) and fibrous (10 species - 4.3%) are represented by a significantly smaller number of species. The least represented are tuber (8 species), tuberous (4 species), bulbous (3 species) and parasites (2 species), which account for 7.2% of the total number of species.

Woody and semi-woody forms together make up 51 species (21.7% of the total number of species), among which the largest number are trees (21 taxa - 8.9%), among them, the main forest-forming species are *Fagus orientalis*, *Pterocarya fraxinifolia* (Poir.) Spach, *Carpinus betulus*, *Quercus petraea* subsp. *polycarpa*, *Q. macranthera* and *Taxus baccata*. As dominants of coenoses often act *Fraxinus excelsior* L., *Acer campestre* L., *A. trautveteri* Medw. Shrub (*Cornus iberica* Woronow, *Lonicera caucasica*, *Ligustrum vulgare*, *Rosa canina* L. etc.), shrub-liana (*Hedera caucasigena* Pojark., *Lonicera caprifolium* L., *Smilax excelsa* L., *Clematis vitalba* L.), semi-shrub (*Hypericum androsaemum* L., *Solanum persicum* Willd. Ex Roem. Et Schult., *Pyracantha coccinea* M. Roem.) an sub-shrubs (*Viscum album* L.) are much less (respectively, 12, 4, 3, and 1), which account for 8.5% of the total number of species. Species with intermediate tree forms (shrub/small tree - 4 and small tree/shrub - 6) – 10 (3.8%). Evergreen trees and shrubs (*Taxus baccata* L., *Pyracantha coccinea*, *Danae racemosa* (L.) Moench, *Juniperus communis* var. *saxatilis* Pall.) are only 4 species (1.7%). Horsetails are represented by 1 species (0.4%) (*Equisetum ramosissimum*), ferns - 4 species (1.7%) (*Asplenium scolopendrium* L., *A. trichomanes* L., *Dryopteris filix-mas* (L.) Schott, *Polypodium vulgare* L.).

New habitats were identified for 13 species (*Artemisia annua* L., *Galinsoga parviflora* Cav., *Tanacetum niveum* Sch.Bip., *Echium vulgare* L., *Camelina glabrata* (DC,) Fritsch, *Cardamine bulbifera* L., *Thlaspi arvense* L., *Coronilla coronata* L., *Geranium ibericum* Cav., *Juncus effusus* L., *Bromus inermis* Leyss., *Asplenium scolopendrium*, *Papaver macrostomum* Boiss. et Huet ex Boiss.) in the studies forest areas.

Out of 235 species growing in the forests of Gabala district, 17 are endemic to the Caucasus (*Atropa caucasica* Kreyer, *Carpinus schuschaensis* H.J.P. Winkl., *Dictamnus caucasicus* Fisch. ex Grossh., *Geranium ibericum* Cav., *Hedera caucasigena* Pojark., *Heracleum sosnowskyi* Manden., *Onobrychis patraea* (M.Bieb. ex Willd.) Fisch., *Pachyphragma macrophyllum* Hoffm. N. Busc., *Potentilla caucasica* Hoffm. N. Busc., *Primula woronowii* Losinsk., *Rubus buschii* (Rozanova) Grossh., *R. ibericus* Juz., *Sedum oppositifolium* Sims., *Sorbus caucasica* Zins., *Sorbus caucasigena* Kom., *Symphytum caucasicum* M. Bieb., *Tanacetum coccineum* (Willd.) Grierson, *Tilia caucasica* Rupr., *Valeriana cardamines* M. Bieb., *Veronica caucasica* M. Bieb., *Veronica crista-galli* Steven), 1 species - endemic to Azerbaijan (*Rosa komarovii* Sosn.), 12 - rare and disappearing (*Pterocarya fraxinifolia*, *Sorbus aucuparia* L., *Taxus baccata* L., *Cornus mas* L., *Pyracantha coccinea*, *Danae racemosa* (L.) Moench, *Crocus speciosus* M. Bieb., *Dactylorhiza romana* subsp. *georgica*, *Epipactis palustris* (L.) Crantz, *Ornithogalum ponticum* Zahar, *Platanthera chlorantha*, *Tanacetum coccineum*) [Ali-zade et al., 2014; Red Book ..., 2013].

To address issues of conservation and rational use of plant resources, it is necessary to have economically important information about the plants themselves to address issues of conservation and growth of their populations. This approach was adopted as the basis for the present study. During the analysis, it was found that out of the total number of species (235) growing in the forests of Gabala district, 164 species are medicinal, among them 33 are official (*Atropa bella-donna*, *Rhus coriaria*, *Sanguisorba officinalis*, *Geum urbanum*, *Rosa canina*, *Thalictrum minus*, *Malva sylvestris*, *Hypericum perforatum*, *Origanum vulgare*, *Polygonum hidropiper*, *Artemisia absinthium* etc.). 29 species are food (*Pimpinella peregrina*, *Asparagus officinalis*, *Silybum marianum*, *Stellaria media*, *Fragaria vesca*, *Rumex acetosa*, *Cornus mas*, *Corylus avellana*, *Mespilus germanica*, *Prunus spinosa*, *Rubus ibericus*, *Malus vulgaris* etc.), 15 - melliferous (*Stellaria holostea*, *Solanum persicum*, *Sorbus torminalis*, *Ulmus scabra*, *Ligustrum vulgare*, *Robinia pseudacacia*, *Sambucus ebulus*, *Lonicera iberica* etc.), 13 – technical (*Acer trautveteri*, *Alnus incana*, *Pterocarya fraxinifolia*, *Fraxinus excelsior*, *Quercus macranthera*, *Celtis caucasica*, *Ulmus elliptica* etc.), 10 – dyeing (*Sambucus nigra*, *Sorbus graeca*, *Alkekengi officinarum*, *Juniperus communis* var. *saxatilis*, *Myricaria germanica* etc.). A significant number of species (52) have decorative properties (*Polygonatum polyanthemum*, *Anacamptis pyramidalis*, *Cephalanthera longifolia*, *Achillea millefolium*, *Anthemis cotula*, *Echium rubrum*, *Dianthus armeria*, *Primula macrocalyx*, *Sedum pallidum*, *Pyracantha coccinea*, *Acer velutinum* etc.) (Fig. 5). All this testifies to the rich economic potential of the district's forest flora and the need for more extensive research in this direction.

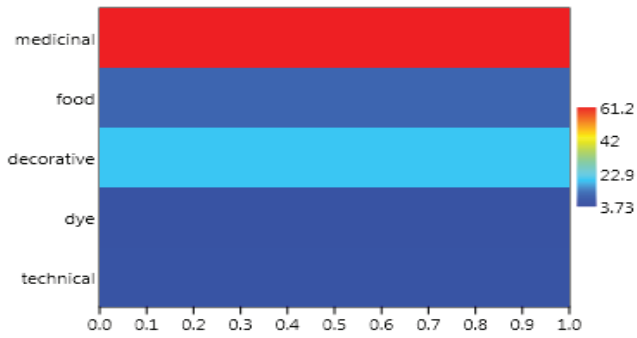

Figure 5. Distribution of species by promising groups.

Description of the coenoses included in the research objects. The forest massif around Gamarvand village of Gabala district is located at an altitude of 861 m above sea level. It is a beech- hornbeam (Faguseto-Carpinusetum) forest. The soil is dark brown, moist. The projective cover of grass stand in coenosis is 80-90%. There are *Fagus orientalis*, *Carpinus betulus*, *Acer campestre*, *Mespilus germanica* species of trees. There were *Crataegus pentagyna* Willd., *Pyracantha coccinea* species in the bush layer, and *Primula acaulis* (L.) L., *Viola alba* Besser, *Artemisia absinthum* L., *Plantago major*, *P. lanceolata*, *Lotus corniculatus* subsp. *corniculatus* L., *Prunella vulgaris* L., *Potentilla inclinata* Vill. *Trifolium media* L., *Polygonatum glaberrimum* K. Koch, *Dactylorhiza romana* subsp. *georgica*, *Platanthera chlorantha*, *Cephalanthera rubra*, *Neottia ovata* species in the grass layer.

The forest massif around Yengija village of Gabala district is located at an altitude of 497 m above sea level. The soil is brown and slightly moist. The projective cover of grass in the coenosis is 90-95%. From the trees, species *Pterocarya fraxinifolia*, *Sorbus graeca* (Spach) Hedl. are found. *Rubus ibericus* Juz. species was recorded in the bush layer, and *Viola arvensis* Murray, *Geum urbanum* L., *Smilax excelsa* L., *Arum elongatum* Steven, *Hedera caucasigena* Pojark., *Alisma plantago-aquatica* L., *Platanthera chlorantha*, *Cephalanthera rubra*, *Neottia ovata* species in the grass layer.

The forest massif around Vandam village of Gabala district is located at an altitude of 1016 m above sea level. The soil is dark brown and moist. The projective cover of grass in the coenosis is 75-80%. Among the trees, *Fagus orientalis*, *Carpinus betulus*, *Acer laetum* C.A. Mey., *Cornus mas* species are found. There was *Corylus avellana* L. species in the bush layer and *Viola arvensis*, *Epipactis palustris*, *Orobanche* sp., *Hedera caucasigena*, *Polygonatum polyanthemum* (M.B.) Dietrich. species in the grass layer.

Ontogenetic structure. The ontogenetic structure of the coenopopulations of plants studied in the study area shows that all coenopopulations are normal, but CP 1 is complete, and other coenopopulations are incomplete due to the absence of subsenile and senile individuals. The highest share percentage of pregenerative individuals was recorded in CP 1, generative individuals in CP 6 and postgenerative individuals in CP 1 (Fig. 6).

Demographic structure. The demographic indicators of

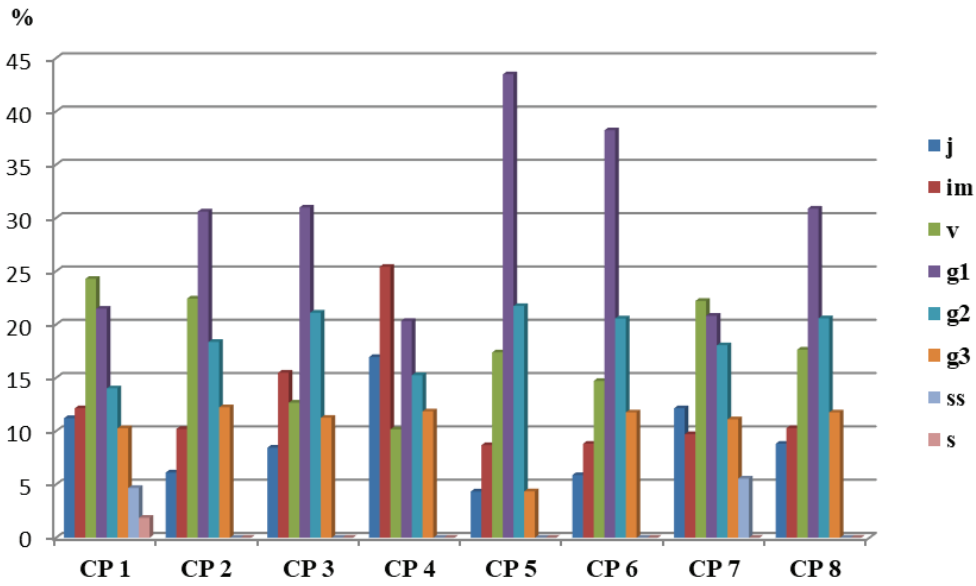

Figure 6. Ontogenetic structure of coenopopulations of rare and sensitive species studied in Gabala district.

Table 2. Spatial and demographic structure of coenopopulations of rare and vulnerable species studied in Gabala district.

No	n	X_{tot}	X_{pre}	X_g	X_{post}	I_{rec}	I_a	I_{rep}	Δ	ω	Type
CP 1	107	7,13	3,17	3,86	3,98	1,041	0, 065	0,911	0,335	0,546	young
CP 2	49	3,27	2,58	4,08	0	0,633	0	0,633	0,315	0,637	in maturation
CP 3	71	4,73	2,44	4,22	0	0,578	0	0,578	0,321	0,631	in maturation
CP 4	59	3,93	3,51	3,16	0	1,107	0	1,107	0,291	0.506	young
CP 5	23	1,53	2,03	4,64	0	0,437	0	0,437	0,295	0,685	in maturation
CP 6	34	2,27	1,96	4,71	0	0,417	0	0,417	0,333	0.681	in maturation
CP 7	72	4,8	2,96	3,52	4,07	0,889	0,056	0,8	0,352	0,575	young
CP 8	68	4,53	2,45	4,22	0	0,582	0	0,582	0,327	0,641	in maturation

Note: n – number of individuals; X_{tot} – total density of individuals (individuals / m^2); X_{pre} – total density of pregenerative individuals (individuals / m^2); X_{gen} – total density of generative individuals (individuals / m^2); Xpost – total density of postgenerative individuals (individuals / m^2); I_{rec} – recovery index; I_a – aging index; I_{rep} – replacement index; Δ – age index; ω – efficiency index.

the studied species are reflected in the table. Looking at the spatial and demographic values of these plants, it can be seen that the number and average density of individuals was recorded, the most in CP 1 and the least in CP 5. Recovery index and replacement index show the highest value in CP 4. Based on Δ and ω indices, CP 1, CP 4, CP 7 are young, CP 2, CP 3, CP 5, CP 6 and CP 8 are mature types (Tab. 2).

In general, when analyzing the situation of coenopopulations of rare and sensitive species in the studied regions, it can be seen that only 1 coenopopulation was found of *Dactylorhiza romana* subsp. *georgica*, which is a young type. However, both coenopopulations of *Cephalanthera rubra*, and *Epipactis palustris* are maturing, 1 coenopopulation of *Platanthera chlorantha* and *Listera ovata* is young, and the other is transitional. Looking at the density of *C. rubra* species per 1 m^2, it can be said that the small number individuals and the lack of ability well with seeds lead to a decrease in the number of this species in the area where it grows. Also, harvesting them by people due to their decorative and medicinal properties and collecting them together with their tubers may lead to a decrease in their number in the future.

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Qəbələ rayonu (Azərbaycan) meşə massivlərinin floristik müxtəlifliyi və nadir növlərin populyasiyalarının vəziyyəti

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Məqalədə Qəbələ rayonunun meşə massivlərinin tədqiqinin nəticələri əks olunmuşdur. Taksonomik analiz nəticəsində tədqiqat rayonunda 4 şöbə, 5 sinif, 28 sıra, 58 fəsilə və 161 cinsə aid 235 taksonun yayılması müəyyən edilmişdir. Bu taksonlar sırasında 17 Qafqaz və bir Azərbaycan endemi, habelə nadir və itməkdə olan 12 növ də vardır. Həyat formaları baxımından, bu taksonların 185-i ot bitkisi, 50-si isə oduncaq və yarımoduncaq formalarına aiddir. Qəbələ rayonunun meşə massivlərində bitən növlərin ümumi sayının (235) 164 növü dərman bitkisi, 29-u qida, 52-si dekorativ, 10-u boyaq, 13-ü texniki bitki növləridir. Nadir və həssas olan *Platanthera chlorantha* (SP 1, SP 2), *Listera ovata* (SP 3, SP 4), *Cephalanthera rubra* (SP 5, SP 6), *Dactylorhiza romana* subsp. *georgica* (SP 7), *Epipactis palustris* (SP 8) taksonlarının senopopulyasiyalarının (SP) demoqrafik və ontogenetik strukturunun öyrənilməsi göstərdi ki, SP-lərin hamısı normaldır, lakin, SP 1 istisna olmaqla, senil və subsenil fərdlərin yoxluğu səbəbindən natamamdırlar. Hesablanmış Δ və ω indekslərinə əsasən, SP 1, SP 4, SP 7 – cavan, SP 2, SP 3, SP 5, SP 6 və SP 8 isə - yetişməkdə olan tiplidir. Tədqiqatın nəticələri üzrə nadir və həssas növlərin bitdiyi yerlərin CİS xəritəsi də tərtib edilmişdir.
Açar sözlər: *flora, həyat formaları, endem, nadir və həssas növlər, iqtisadi vacib bitkilər*

Флористическое разнообразие и состояние популяций редких видов в лесных массивах Габалинского района (Азербайджан)

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В статье представлены результаты исследования лесных массивов Габалинского района. В результате таксономического анализа установлено произрастание в районе исследования 235 таксонов, объединенных в 4 отдела, 5 классов, 28 порядков, 58 семейств и 161 род. Среди исследованных таксонов выявлено 17 эндемиков Кавказа, один - эндемик Азербайджана и 12 редких, исчезающих видов. По своим жизненным формам 185 таксонов представляют собой травянистые, 50 – древесные и полудревесные формы. Из общего числа (235) видов, произрастающих в лесных массивах Габалинского района 164 вида, являются лекарственными, 29 – пищевыми, 52 – декоративными, 10 - красильными, 13 – техническими. Изучение онтогенетической и демографической структуры ценопопуляций (ЦП) редких и уязвимых таксонов *Platanthera chlorantha* (ЦП 1, ЦП 2), *Listera ovata* (ЦП 3, ЦП 4), *Cephalanthera rubra* (ЦП 5, ЦП 6), *Dactylorhiza romana* subsp. *georgica* (ЦП 7), *Epipactis palustris* (ЦП 8) показало, что все ЦП нормальные, однако из-за отсутствия сенильных и субсенильных особей - неполночленные (за исключением ЦП 1). Согласно индексам Δ и ω ЦП 1, ЦП 4, ЦП 7 - молодые, а ЦП 2, ЦП 3, ЦП 5, ЦП 6 и ЦП 8 - зреющие. Также по результатам исследования составлена ГИС карта мест произрастания редких и уязвимых видов.
Ключевые слова: *флора, жизненные формы, эндемики, редкие и уязвимые виды, экономически важные растения*