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GEOBOTANICAL DESCRIPTION AND ECOLOGY OF THE POPULATION OF THE ENDEMIC SPECIES GALATELLA SAXATILIS NOVOPOKR. IN SYUGATY MOUNTAIN GORGE

This article presents the geobotanical characteristics and ecological conditions of populations of the endemic species Galatella saxatilis found in the mountain gorge of Syugata.

The natural conditions of the territory are reconsidered: topography, soil cover, water resources, climate, where the object of research is found, and geobotanical characteristics of plant community types are compiled. The results are filled in the table and displayed in the figures. The percentage of yield of types in communities is calculated.

The morphological features of the Galatella saxatilis species are described and the life States and quality level of generative stems are determined. During repeated observations of the species Galatella saxatilis, only 7 individuals were found in the first population. The second population contained 10 individuals. The following types are distinguished by life States: generative age(g1), mature(g2), old(g3) and postgenerative sub-senile(ss), senile(s).

24 plant species found in the population have been identified and a systematic list has been compiled.

The main tasks of the research work were completed in full and successfully completed.

Key words: topography, water resources, soil cover, climate, plant communities, forage yield, community types.

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1«Азаматтарға арналған үкімет» мемлекеттік корпорациясы коммерциялық емес акционерлік қоғамының Алматы қаласындағы филиалы – Агрохимиялық, топырақ зерттеу және кешенді іздестіру жұмысы департаменті, Қазақстан, Алматы қ.
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Сөгеті тау шатқалындағы эндем түр Galatella saxatilis NovoPokr. популяциясының экологиясы мен геоботаникалық сипаттамасы

Бұл мақалада Сөгеті тау шатқалында кездесетін эндем түр Galatella saxatilis популяцияларының геоботаникалық сипаттамасы мен экологиясы жағдайлары қарастырылған.

Зерттеу объектісі кездесетін аумақтық табиғи жағдайлары: жер бедері, топырақтық, климаты, су ресурстары, сапалық департамент, Қазақстан, Алматы қ.

Galatella saxatilis түрінің морфологиялық ерекшеліктері сипаттелді, тіршілік күйлері мен генеративті сабактарының сапалық дене сипатталған. Galatella saxatilis түрінің бірнеше рет қайталап бақылау барысында бірнеше популяцияларда 7 дақар қана кездесті. Ал, екінші популяцияда 10 дақар кездесті. Тіршілік күйлері бойынша: генеративті жас(g1), піскен(g2), сенілен(g3) және постгенеративті субсенилді(s), сенилді(s) түрдік ажыратылады.

Популяцияларда кездесетін 24 осімдік түрі анықталды, систематикалық тізім жасалды.

Түйіндегі сөздер: жер бедері, су ресурстары, топырақ, климат, осімдіктер қауымдасы, оңімділік, түсім пайызы, қауымдастық түсті.

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Геоботаническое описание и экология эндемического вида популяции
*Galatella saxatilis* Novopokr. в Сюгатинском горном ущелье

В данной статье приведена геоботаническая характеристика и экологические условия популяций эндемичного вида *Galatella saxatilis*, встречающегося в горном ущелье Сюгаты.

Рассмотрены природные условия территории: рельеф, почвенный покров, водные ресурсы, климат, на которой встречается объект исследования, и составлена геоботаническая характеристика типов растительного сообщества. Полученные результаты занесены в таблицу и отображены на рисунках данной статьи. Рассчитан процент урожайности типов в сообществах.

Описаны морфологические особенности вида *Galatella saxatilis* и определены жизненные состояния и уровень качества генеративных стеблей. В ходе неоднократных наблюдений за видом *Galatella saxatilis* в первой популяции встречались только 7 особей. Во второй популяции встречались 10 особей. По жизненным состояниям различают следующие типы: генеративный возрастной (g1), зрелый (g2), старый (g3) и погестрогенеративный субсенильный (ss), сенильный (s).

Определены 24 вида растений, встречающихся в популяции, и составлен систематический список.

Основные задачи исследовательской работы выполнены в полном объеме и успешно выполнены.

**Ключевые слова:** рельеф, водные ресурсы, почвенный покров, климат, сообщества растений, кормовой урожайность, типы сообществ.

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**Explanation of some concepts**

*Forage unit* – measuring unit of fodder value calculated on 1 kg of dry grass.

*Topography (relief)* – structure, general appearance and natural characteristics of the Earth’s surface in a particular area.

*Plants cover* – a community of plants growing on Earth.

*Productivity*– an indicator that characterizes the average yield of agricultural products (usually the harvest collected from 1 hectare of land is calculated in quintals).

**Introduction**

Re-study and correction of geobotanical survey materials requires conducting an average of once every ten years to identify quantitative and qualitative changes in vegetation cover and as the main methods of assessing the state of plants, as well as in the monitoring mode. In accordance with the requirements of the time, environmental issues, including the preservation of biodiversity and bioresources, have become one of the most important topics that must be addressed to all mankind [1-2].

The issue of plant protection and preservation of the plant gene pool, especially the preservation of endemic and rare relict species, has now become one of the most pressing issues. In order to preserve the species of plants that are currently threatened with extinction in nature, it is necessary to take into account all types of plants that need protection in order to effectively use plant resources [3-4].

Since endems and rare plants are important components of the flora, there is an increasing need for various geobotanical studies of them [5]. Most of them are listed in the Red Book and are protected by the special law of the Republic of Kazakhstan.

The main tasks set for the course of work in this direction are:

1) Focus on the natural conditions of the sögeti mountain gorge (terrain, climate, water resources, soil cover);
2) Identify and draw up a systematic list of the main plant groups and species in the distributed area of the research object;
3) Development of a morphological description of the studied species using basic geobotanical methods.

**Research materials and methods**

The object of the study was the main features of the endemic species *Galatella Saxatilis* Novopokr, found in the Sogeti mountain gorge in the southeastern part of Sogeti rural district of Enbekshikazakh District of Almaty region.
Galatella saxatilis is a rare, limited endemic species. Perennial, 20-30 cm tall, the base of the stem is hard. The leaf ribbon is lanceolate, the ends are minimized. Baskets are collected in a loose shield, or single, with mother flowers at the edges, tapered, ash-shaped rudiments. The flowers are Terry, tubular pale yellow in color. The seeds are short-haired, with serrated spines. Blooms in July-September. It is propagated by seeds. It is found on rocks, rocky slopes. It is distributed in the Syugeti gorge in the eastern part of the Trans-Ili Alatau. The main dangerous conditions are: low population size, constant grazing of livestock. 

The species is listed in the Red Book of Kazakhstan. Control over the state of the natural population, study of the biological characteristics of the species in cultural conditions [6-7].

The main geobotanical methods were used in the control of the object of study, the description of the species composition and morphological features.

Methods for determining productivity

Two methods of calculating productivity are used to determine the productivity of natural pastures. They are: the method of sowing (root field) and the method of model plant or shrub (vertical root system – root). The first method is used for herbaceous and deciduous shrubs, the second – for shrubs and deciduous shrubs. [8].

Reaping method. At the site of the description, a rectangular 1x1 m cutting area is used. If the projective coating of the community is uniform, the mowing area should be laid 4 times, and if the vegetation is sparse, the area should be laid 8 times. In shaggy pastures, a 1x2.5 m cutting area is laid out in the open ground between bushes [9].

When determining productivity, the total weight (including non-pollinated plant species) and the dry weight of feed per hectare are taken (if there is only one livestock, the pollinated plant). At the same time, during the study of the plant, the moisture weight is also measured, which is necessary to determine the drying coefficient of the plant. Therefore, once every decade, the moisture weight of the plant is measured. All information is filled in on the form and converted to hundredweight [10].

Model plant method. The accuracy of the method depends primarily on the accuracy of determining the average size of the plant, the selection and quantity of the model plant. This method is used to determine the yield of shrubs, semi-shrubs and large herbaceous plants. In the Model Method, a 10x10 m transect is constructed. Bushes inside the transect are united in 2-3 groups in height and diameter. From each group, 5-10 plants are taken from small ones, and 1-2 from large ones, according to which the wet and dry weight is measured. Then the average weight of one plant is calculated and the yield per hectare is calculated. The number of pieces of bushes is taken at each description, and the yield is measured once in a decade [11].

Research results and their analysis

Ecological conditions of Galatella saxatilis populations

The main relief of the studied territory is a rocky, rocky Mountain system with a high belt, with an absolute height of 600 to 3000 meters. The rocky Mountains here are classified as low mountains. The rocky Mountains of Syugata are a mountain range consisting of strongly cut, rocky slopes consisting of open rocky rocks and high cliffs forming a gorge [12].

The main water system of the sögety mountain gorge includes the waters of the Syugata, Almaly, and Sarbastau rivers. This is where the streams of Karabulak and Akshitek Springs begin. These springs and springs flow mainly from the bowels of the mountains and are filled with rain and snow waters depending on the season.

Since the gorges of Syugata are a High-Altitude Area, the climatic conditions are Continental, characterized by cold winters and cold summers. The number of days that exceed +10°C is 150. According to long-term indicators, the average annual air temperature is –0.2°C. The average precipitation is 407 mm.

The spring season in the mountains begins from 2-3 December of April. The average temperature at this time +1,3°C, and in May +6,2°C, in June +9,5°C.

The first cold snap is observed in September. And the main snow cover falls at the end of October. Snow height varies between 25-90 CM. Snow cover and cold retention are observed for up to 160 days.

In the mountainous region, there is also a weak wind. Its speed is 2-4 m/s. In winter, wind gusts are detected for 1-3 days. In addition, there are also fogs 8-10 days a month [13-14].

On the high, rocky slopes of the Syugata mountains, undeveloped light brown soil of the mountain is found. These soils form a weak humus horizon of 20-30 cm. In addition, they often contain dirty substances and stones [15-16].

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Geobotanical description and ecology of the population of the endemic species *Galatella saxatilis* Novopokr. ...

**Galatella saxatilis geobotanical characteristics and morphological features of the population**

**Population.** Terrain elements play an important role in the distribution of vegetation cover. In all parts of the district, it covers a large area, forming a complex of grass-grain pastures, sagebrush and ephemera. Zhetsyzhusan and karazhusan pastures are also common. On the banks of river valleys and streams, kokpekty pastures are distributed, forming a complex with sagebrush, sorrel, grain- various grasses, grain-licorice-sagebrush pastures. As a result of the study, a geobotanical description of the first population found in *Galatella saxatilis* was carried out. The first population was identified at the top of a mountain gorge, 2.5 km southwest of the village of Kokpek, and the vegetation of the community was described. The first determined population determined the species composition of the community and gave it a geobotanical description. The plant community, distributed in low-lying mountainous terrain, on muddy gravel-

Stony dark brown soil of the Mountain, Forms two types of complexes. A special geobotanical form was filled out and the following description was given.

The first type is bushy – Semirechye sagebrush-cereal *Galatella saxatilis*. Low mountainous terrain with an absolute height of 972 m. Soil moisture occurs atmospheric. The projective coverage of the soil with plant cover is 65%. The dominant here is the bushes. The percentage in the association is 25%. Among the shrubs are *Spiraea hypericifolia*, *Rosa spinosissima* and *Cerasus tianschanika*. The height of the bushes varies from 65 cm to 135 cm. The subdominant is *Artemisia heptapotamica* – 20%. Its height is 30-58 cm. Grain crops occupy the third place, making up 15% of the community. These include: *Stipa sareptana*, *Koeleria gracilis* and *Festuca sulcata*. The height is observed, respectively – from 10 to 55 cm. *The Galatella saxatilis* is distributed evenly everywhere, with a share of 5% in the community type [17-19].

![Figure 1 – Control of the species composition of the association by the method of harvesting](image)

There are also individual plants that are part of the community. They are: *Helianthemum soongoricum*, *Scutellaria transelensis*, *Seseli strictum*, *Lonicera microphylla*, *Acanthophyllum pungens*, *Bromus inermis*, *Peganum harmala*, *Carex pachystylis*, *Ephedra intermedia*, *Meniocus linifolius*, *Poa bulbosa*.

At the designated place, the plants of the area 1m² were completely cut by the method of harvesting, each plant was wrapped in individual papers and dried in a special shady covered place. Dried plants for 7-10 days were weighed on an electronic scale to determine their dry weight. Accordingly, the yield of the general type of production was calculated [20].

Total summer yield of dry mass type 9.5-12.0 d/ha. Seasonal yield of fodder(d/ha): in the spring \( \frac{7.6}{4.3} \cdot \frac{8.5}{4.9} \), in summer \( \frac{8.4}{5.1} \cdot \frac{9.8}{5.7} \), in autumn \( \frac{6.1}{3.3} \cdot \frac{7.8}{4.2} \), winter \( \frac{4.7}{2.1} \cdot \frac{6.0}{2.5} \).
The second type – **Cereal-zhetysu wormwood-galatella type**. Low mountainous terrain with an absolute height of 972 m. Soil moisture occurs atmospheric. The projective coverage of the soil with plant cover is 70%. The dominant here is cereals. The percentage in the association is 40%. They are: *Stipa caucasica*, *Stipa capillata*, *Poa bulbosa* and *Festuca sulcata*. Heights range from 10 to 60 cm, respectively. Subdominant *Zhetysu wormwood* – 20%. Its height is 30-55 cm. *Galatella saxatilis* is in third place with a 10% share of the community. Height 12-28 cm. Қауымдастық құрамына кіретін өсімдіктер де бар. They are: *Acanthophyllum pungens*, *Carex pachystylis*, *Scutellaria transiliensis*, *Seseli strictum*, *Lonicera microphylla*, *Ephedra intermedia*, *Meniocus linifolius*, *Poa bulbosa*, *Spiraea hypericifolia*, *Cerasus tianschanika*.

Total summer yield of dry mass type 6.5-9.5 d/ha. Жемдік массаның мезгіл бойынша түсімі (d/ha): in the spring 6.6 – 7.0, in summer 7.5 – 9.5, in autumn 5.8 – 7.4, winter 4.6 – 5.8.

In the course of several repeated measurements of the method of harvesting the *Galatella saxatilis* plant found in the main mountain gorge at the site 1м² (1x1), the density and generative active organs of the *Galatella saxatilis* were classified, and the morphological features of the plant showed the following results:

There were 2 trees in the first square. Tree₁ – belongs to the genus mature (g2) type with mature generative organs. Number of generative stems – 3. The corresponding indicators of seeds in a basket inflorescence: 1 – 13 seeds, 2 – 12 seeds, 3 – 15 seeds. The height of the plant is 15-22 cm. Tree₂ – state of life generative aging (g3). Number of generative stems – 1. The corresponding indicators of seeds in a basket inflorescence: 1 – 11 seeds. The height of the plant is 17-25 cm.

There were no *Galatella saxatilis* in the second square.

There was only one tree in the third square. It belongs to the generative mature (g2) type. Number of generative stems – 2. Seedlings in the basket inflorescences, respectively: 1 – 7 seeds, 2 – 10 seeds. The height of the plant is 17-25 cm.

There was a tree in the fourth square. According to the state of life were divided into postgenerative suberyn (ss). There are no generative stems, the flowers are fallen. The height of the plant is 15-23 cm.

On the fifth, sixth, and seventh squares, there were no *Galatella saxatilis*.

Only one tree met in the eighth square. The state of life is generative mature (g2). The number of generative stems is 2. The corresponding indicators of seed germination in the basket inflorescence are: 1 – 9 seeds, 2 – 13 seeds. The height of the plant is 15-27 cm.

There were no trees in the ninth square.

Two trees met in the tenth square. Tree₁ – generative maturity (g2). The number of generative stems – 3. Seeds in the basket inflorescence, respectively: 1 – 10 seeds, 2 – 9 seeds, 3 – 12 seeds. The height of the plant is 13-24 cm. Tree₂ – state of life generative aging (g3). Number of generative stems – 1. The corresponding indicators of seeds in a basket inflorescence: 1 – 12 seeds. The height of the plant is 15-25 cm.

The study was conducted in the last stages of the life cycle of the plant *Galatella saxatilis*, which became the basis for its description only on the basis of generative maturity and postgenerative life. Depending on the method of harvesting, the nu-

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**Figure 2** – Growth of the *Galatella saxatilis* on the rocky slopes of the Syugata gorge
merical density of the object of study on the land plot 1m² was determined, and the projective soil coverage was determined. The number of generative stems of each tree was calculated, and the indicators of seed production and reproduction were determined.

**Population.** The second population of the species was identified 1.5 km south-west of the Suygata mountain gorge, 1.5 km south of the first population, and community vegetation was described. The species composition of the community was determined and a geobotanical description was given. Only one type was distinguished in the defined community area. The plant community with the absolute height of 1025 m, located in the low mountainous terrain, on the clayey gravel-brown soils of the mountain, forms the following type: steppe-shrub-grain-shrub type. A special geobotanical form was filled out and described as follows.

**Shrub grain-galatella type.** Soil moisture occurs atmospheric. The projective coverage of the soil with plant cover is 65%. The surface layers of the soil are large-lobed, and the visibility of the rocks is clearly marked. The dominant here are the bushes. The percentage in the association is 35%. Among the bushes are *Spiraea hypericifolia*, *Cerasus tianschanika*, *Rosa spinosissima*. The height of the bushes reaches from 60 cm to 115 cm.

Subdominant-cereals. They account for 25% of the community. They are: *Stipa sareptana*, *Stipa caucasica* and *Festuca sulcata*. The height will be from 10 to 55 cm, respectively. The *Galatella saxatilis* is distributed evenly everywhere, with a share of 5% in the community type.

![Figure 3](image-url) – During the observation of the second population of the *Galatella saxatilis*

List of individual plants that are part of the association: *Artemisia heptapotamica*, *Artemisia terrae-albae*, *Lonicera microphylla*, *Caragana pleiophylla*, *Eremopyrum orientale*, *Lasiagrostis splendens*, *Acanthophyllum pungens*, *Carex pachystylis*, *Ephedra intermedia*, *Scutellaria transeliensis*, *Meniocus linifolius*, *Seseli strictum*, *Poa bulbosa*, *Spiraea hypericifolia*.

According to the association, the plants of the sampled land were dried and the percentage and yield indicators were calculated.

**Total summer yield of dry mass type 8.4-11.2 c/ha. Seasonal receipt of feed mass (d/ha):**

|                     | Fodder unit |
|---------------------|-------------|
| **in the spring**   | 7.4 - 8.1   |
|                     | 4.1 - 4.8   |
| **in the summer**   | 9.8 - 10.2  |
|                     | 5.3 - 5.9   |
| **in the autumn**   | 5.9 - 7.2   |
|                     | 3.8 - 4.1   |
| **in the winter**   | 4.5 - 5.5   |
|                     | 1.9 - 2.7   |

In the course of several repeated measurements of the method of reaping the *Galatella saxatilis* at an area of 1m² (1x1), the density and generative active organs of the species were classified, and the morphological features of the plant showed the following results:

The tree in the first square belongs to the generative age (g1) type with mature generative organs. Number of generative stems – 3. Seeds in the basket inflorescence, respectively: 1 – 11 seeds, 2 – 14 seeds, 3 – 12 seeds. The height of the plant is 12-20 cm.

In the second square there was only one *Galatella saxatilis*. According to the state of life, it belongs to the generative aging type (g3). It is a plant before flowering, without flowers. Height – 13-22 cm. Two trees met in the third square. Tree, generative maturity (g2). Number of flower stalks...
– 2. Seeds in the basket inflorescences, respectively: 1 – 15 seeds, 2 – 13 seeds. Plant height – 15-23 cm. Tree_2^g_2 generative maturity (g2). Number of generative stems – 2. Seed inflorescences in the basket, respectively: 1 – 10 seeds, 2 – 16 seeds. The height of the plant is 18-22 cm. In the fourth and fifth squares there were no trees of the Galatella saxatilis.

Two trees in the sixth square. Tree_1^g_2 generative maturity (g2). Number of flower stalks – 1. The corresponding indicators of seeds in a basket inflorescence: 1 – 14 seeds. The height of the plant is 14-20 cm. Tree_2^s postgenic senile (s). There are no generative stems. The height of the plant is 13-20 cm.

In the seventh square there was only one Galatella saxatilis. It is a postgenerative senile (s) by state of survival. A species without flowers, about to wither. Plant height is 15-22 cm.

There were no trees in the eighth and ninth squares.

There were three trees in the tenth square. Tree_1^g_3 generative aging (g3). Number of generative stems – 1. Number of seeds in a basket inflorescence – 9 seeds. The height of the plant is 15-22 cm. Tree_2^g_3 state of life generative aging (g3).

There is no generative stem. The seeds in the basket have completely fallen off. Plant height – 17-23 cm. Tree_3^ss postgenerative subsenyl (ss). There is no generative stems. The height of the plant is 20-25 cm.

**Productivity and chemical composition of forage plants in the plant community**

Pastures and pasture forage are important for animals. Green grass is a type of highly nutritious fodder. Grasses of good pastures, especially cereals and legumes, contain up to 10 kg of protein and 100 feed units per 100 kg. In addition, the digestibility of forage grass is 15-20% lower than that of green grass. Pasture grass, for example, contains 10 times more vitamin A than fodder grass [21-22].

Pasture grasses must contain minerals (calcium and phosphorus salts) that have a lasting effect on the growth and development of animals. Pasture composition has a multifaceted effect on animals. It creates favorable conditions for the proper development and growth of food and increases its resistance to various diseases [23-24].

According to such data, the chemical composition of plants directly suitable for fodder production in the study area was determined, the relative level of absolute productivity of natural organic matter and total feed mass was determined [25-26].

**Systematic list of plant species in the plant community**

The list of plants found in the study by double populations of Galatella saxatilis was compiled and filled in the table below [27].

| №  | Plant species           | Season of the year | Occurs in the absolute dry matter of forage, % | 100 kg abs. occurs in dry fodder, kg |
|----|------------------------|--------------------|---------------------------------------------|------------------------------------|
|    |                        |                    | protein | fat | % cage | BBZ | ash | Absorbable protein | feed unit |
| 1  | Festuca sulcata (Hack.) | winter             | 3,77    | 0,93| 39,97  | 46,42| 8,91| 2,08              | 42,6      |
|    |                        | spring             | 13,67   | 2,97| 27,82  | 45,99| 9,55| 9,06              | 72,8      |
|    |                        | summer             | 7,97    | 2,69| 33,99  | 47,65| 7,70| 5,10              | 61,0      |
|    |                        | autumn             | 6,19    | 2,99| 36,22  | 46,76| 7,84| 3,81              | 51,3      |
| 2  | Stipa caucasica Schmalh.| spring             | 11,90   | 3,17| 29,13  | 49,39| 6,40| 8,64              | 75,2      |
|    |                        | summer             | 7,01    | 3,31| 33,28  | 19,14| 7,26| 4,69              | 67,4      |
|    |                        | autumn             | 3,92    | 3,70| 36,48  | 50,47| 5,43| 3,18              | 59,2      |
| 3  | Koeleria gracilis Pers. | winter             | 2,84    | 1,30| 38,68  | 53,38| 3,80| 1,40              | 43,0      |
|    |                        | spring             | 21,52   | 3,30| 26,22  | 40,17| 8,79| 15,70             | 83,0      |
|    |                        | summer             | 7,63    | 2,80| 31,85  | 52,53| 5,19| 4,96              | 60,6      |
Continuation of table 1

| № | Plant species       | Season of the year | Occurs in the absolute dry matter of forage, % | 100 kg abs. occurs in dry fodder, kg |
|---|---------------------|--------------------|-----------------------------------------------|--------------------------------------|
|   |                     |                    | protein | fat | cage | BBZ | ash | Absorbable protein | feed unit |
| 1 | 2                   | autumn             | 4       | 5   | 6    | 7   | 8   | 9                | 10        |
|   |                     |                    | 4,72    | 2,48| 36,20| 51,66| 4,94| 2,14             | 45,5      |
| 4 | Poa bulbosa L.      | winter             | 4,26    | 1,16| 39,04| 48,19| 7,35| 2,25             | 76,3      |
|   |                     | spring             | 12,22   | 2,44| 28,97| 49,72| 6,65| 8,52             | 104,8     |
|   |                     | summer             | 6,25    | 1,87| 33,24| 53,31| 5,33| 3,83             | 87,2      |
|   |                     | autumn             | 3,72    | 1,50| 40,06| 49,89| 4,83| 1,98             | 78,6      |
| 5 | Bromus inermis      | winter             | 6,04    | 1,10| 38,23| 45,81| 8,92| 3,26             | 56,7      |
|   | Leyss.              | spring             | 11,65   | 2,58| 30,87| 47,68| 7,22| 7,24             | 65,9      |
|   |                     | summer             | 6,72    | 1,98| 32,68| 51,50| 6,60| 3,98             | 66,1      |
|   |                     | autumn             | 5,00    | 1,58| 36,10| 51,63| 5,69| 2,71             | 65,4      |
| 6 | Stipa sareptana     | winter             | 3,18    | 2,75| 45,77| 40,52| 7,78| 1,68             | 35,9      |
|   | (Beck)              | spring             | 13,01   | 2,92| 30,52| 44,42| 9,13| 9,50             | 75,9      |
|   |                     | summer             | 8,25    | 2,41| 32,18| 51,18| 5,98| 5,55             | 68,4      |
|   |                     | autumn             | 5,40    | 2,30| 35,01| 51,27| 6,02| 3,23             | 56,2      |
| 7 | Carexpachystylis     | winter             | 3,27    | 0,45| 36,13| 53,45| 6,70| 1,75             | 47,1      |
|   | J.Gay.              | spring             | 11,69   | 2,59| 29,30| 47,07| 9,35| 7,95             | 69,1      |
|   |                     | summer             | 8,29    | 2,52| 32,29| 49,34| 7,56| 5,25             | 66,0      |
|   |                     | autumn             | 5,24    | 2,34| 36,89| 48,05| 7,48| 2,81             | 45,1      |
| 8 | Eremopyrum orientale| spring             | 7,68    | 2,52| 17,81| 41,09| 29,08| 7,29             | 70,0      |
|   | Jaub.               | summer             | 10,19   | 3,08| 19,01| 43,43| 26,80| 5,68             | 70,4      |
| 9 | Artemisia terrae-alba| spring             | 13,46   | 3,42| 25,31| 49,29| 8,52| 10,08            | 80,1      |
|   | Krasch.             | summer             | 10,16   | 5,03| 25,76| 52,00| 7,05| 6,71             | 73,4      |
|   |                     | autumn             | 8,81    | 6,23| 27,24| 50,48| 7,27| 5,21             | 74,7      |
| 10| Artemisia heptapotamica| spring            | 15,67   | 5,12| 21,33| 47,80| 10,08| 11,49            | 85,6      |
|   | Poljak.             | summer             | 10,47   | 6,18| 24,63| 50,51| 8,21| 8,12             | 83,8      |
|   |                     | autumn             | 8,76    | 6,84| 27,01| 50,39| 7,00| 6,22             | 72,0      |
| 11| Galatella saxatilis  | winter             | 6,57    | 3,96| 28,42| 55,88| 5,17| 2,81             | 46,0      |
|   | Novopokr            | spring             | 17,73   | 4,77| 21,12| 45,97| 10,41| 13,24            | 81,6      |
|   |                     | summer             | 11,10   | 6,12| 22,84| 52,68| 7,26| 7,87             | 76,8      |
|   |                     | autumn             | 8,43    | 5,73| 26,78| 52,89| 6,17| 4,35             | 55,7      |
| 12| Spiraea hypericifolia| winter             | 3,53    | 1,41| 30,93| 45,76| 8,94| 1,41             | 21,0      |
|   | L.                  | spring             | 17,50   | 2,06| 33,74| 40,80| 10,40| 8,52             | 53,5      |
|   |                     | summer             | 11,55   | 2,11| 34,36| 41,16| 10,82| 5,52             | 46,3      |
|   |                     | autumn             | 6,46    | 1,92| 38,25| 40,08| 13,29| 2,74             | 29,9      |
Table 2 – List of plants in the population of *Galatella saxatilis* in the gorges

| №  | Latin scientific name of plants | Kazakh name | Russian name | Life form |
|----|--------------------------------|-------------|--------------|----------|
| 1  | Acanthophyllum pungens (Bge.) Boiss. | Тікенді бозтікен | Колючелистник колючий | Perennial |
| 2  | Artemisia heptapotamica Poljak. | Жетісу жусан | Польнь семиреченская | Perennial |
| 3  | Artemisia terrae-albae Krasch. | Бол жусан | Польнь белоземельная | Semi-shrub |
| 4  | Bromus inermis Leyss. | Кызыл батырбасы | Костер безостый | Perennial |
| 5  | Caragana pleiophylla ( | Копжанырақтары қараган | Караганамноголистая | Bush |
| 6  | Carex pachystylis J.Gay. | Толық қияқөлең | Осока толстостолбиковая | Perennial |
| 7  | CerasustianschanikaPojark. | Тәншән шиесі | Вишня тяньшанская | Bush |
| 8  | Ephedra intermedia Schrenk. | Қызыл тамыр қылша | Хвойник средний (эфедра) | Bush |
| 9  | Eremopyrum orientale (L.) Jaub. Et Spach. | Шығыс мортығы | Мортук восточный | Annual |
| 10 | Festuca sulcata Hack. | Қоңырбас шисабақ | Тонконог тонкий | Perennial |
| 11 | Galatella saxatilis Novopokr. | Жартас далазығыры | Солонечник скальный | Perennial |
| 12 | Helianthemum soongoricum | Жоңғар сәулетгүлі | Солнцецвет джунгарский | Perennial |
| 13 | Koeleria gracilis Pers. | Қоңырбас шисабақ | Тонконог тонкий | Perennial |
| 14 | Lasiagrostis splendens (Trin.) Kunth. | Ақ ший | Чий блестящий | Perennial |
| 15 | Lonicera microphylla | Ұсақжапырақ үшқаты | Жимолость мелколистная | Bush |
| 16 | Meniocus linifolius (Steph.) D.C. | Жабрица торчащая | Жабрица торчащая | Annual |
| 17 | Peganum harmala L. | Жармас далазығыры | Солнцецвет джунгарский | Perennial |
| 18 | Poa bulbosa L. | Жуашықты қоңырбас | Мятлик луковичный | Perennial |
| 19 | Rosa spinosissima L. | Аран раушан | Шиповник колючейший | Bush |
| 20 | Seseli strictum | Єрбішен тяранчик | Жабріца торчащая | Perennial |
| 21 | Scutellaria transeliensis | Іле тяранчик | Скутеллярія (шлемник) илийская | Perennial |
| 22 | Spiraea hypericifolia L. | Шайқурай тобылғы | Таволга зверобоелистная | Bush |
| 23 | Stipa caucasica Schmalh. | Ак қырыстаң | Ковыль кавказский | Perennial |
| 24 | Stipa sareptana Beck. | Тырымқау | Ковыль сарептский | Perennial |

**Conclusion**

Thus, on the basis of the conducted geobotanical research, two populations of the endemic species *Galatella saxatilis* were identified and their communities were studied, which are found in the Syugata mountain gorge of Syugata rural district of Enbekshikazakh District of Almaty region. The topography, climate, soil and water system of the mountain gorge were described and the main physical features were shown. The Rocky Mountains of Syugata are a mountain range consisting of strongly cut, rocky slopes, open Rocky rocks and high cliffs that form a gorge.

The main water system of the Syugata mountain gorge includes the waters of the Sögety, Almaly, and Sarbastau rivers.

Since the gorges of Syugata are a High-Altitude Area, the climatic conditions are Continental, characterized by cold winters and cold summers. The number of days that exceed +10°C is 150. According to Perennial indicators, the average annual air temperature is -0.2°C. The average precipitation is 407 mm.

The average temperature at this time is +1.3°C, in May +6.2°C, and in June +9.5°C.

The first cold snap is observed in September. The main snow cover will fall in late October. The snow depth is 25-90 cm. Snow cover and cold storage are observed for up to 160 days.

On the high, rocky slopes of the Syugata mountains there is an underdeveloped light brown soil. These soils form a weak humus horizontal, 20–30 cm. In addition, they often contain dirt and stones.
The plant community was classified into types and special geobotanical forms were filled out. According to the first population, two types were distinguished: Shrub-mature wormwood-cereal steppe-cereal type and Cereal-mature wormwood-steppe type. Productivity of the types was determined and the total summer harvest was calculated.

Density and generative active members of the species were classified and the morphological features of the plant were determined during several repeated measurements of the rocky steppe vegetation found in the mountain gorge on 1m² (1x1).

The study was conducted in the last stages of the life cycle of the plant Galatella saxatilis, which became the basis for its description only on the basis of generative maturity and postgenerative life. Depending on the method of harvesting, the numerical density of the object of study on the land plot 1m² was determined, and the projective soil coverage was determined. The number of generative stems of each tree was calculated, and the indicators of seed production and reproduction were determined.

During the full development of the vegetation of the Syugata mountain gorge, a systematic list of plants found in the population of rock-grass vegetation was made. The amount and chemical composition of crops were calculated and tabulated by species.

The conducted geobotanical work is an important study in determining the population characteristics of the rocky steppe and its place in the flora as an endemic species. As a species listed in the Red Book, one of the main tasks of the work was to preserve the species composition, population density and quality. Morphological characteristics of the species have become a prerequisite for further study of the species.

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