The lowest cellulolytic activity was found in the soil of the Voronezh region. The percentage of decomposed cellulose ranges from 6,03% to 6,7%. Such indicators are probably due to high anthropogenic load, lack of vegetation cover, and possible contamination of the soil with heavy metals [4, 5].

Conclusion

Paramagnetic activity depends on the characteristics of soil formation and changes due to the definite depth. The reason for this may be the exploitation and disturbance of the soil, as well as other natural processes.

In the soil samples taken from the territory of the Voronezh region and the field prepared for sowing, the highest concentration of free radicals appears (1,22 and 1,208), but the lowest percentage of decomposed cellulose is observed (6,7% and 6,03%).

In soil samples taken from the Rostov region, the lowest concentration of free radicals appears (0,54 and 0,25), but there is a high percentage of decomposed cellulose (40,69% and 14,39%).

This may be thanks to the fact that biological productivity is higher in the upper soil layers, and this contributes to the natural processing of various residues of grassy vegetation and animals deposits.

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To the Question of Inventory of Flora Species Diversity of «Dolgaya Spit» of the Krasnodar Territory

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Abstract

The article examines the state of floristic diversity of higher vascular plants of the nature monument “Dolgaya Spit” (Yeisk district). The floristic diversity of the “Dolgaya Spit”, including 133 plant species based on the study of steppe, littoral and anthropogenically altered communities was established. The data on the taxonomic structure of the flora, the occurrence of species, the number of rare plant species are given in the research. Phytocenoses on the “Dolgaya Spit” are subject to significant anthropogenic impact, which requires the development of regulated sustainable recreational nature management.

Keywords: “Dolgaya Spit”, rare species, littoral, biodiversity, Eastern Azov region, protected areas.

Аннотация

В статье рассматривается состояние флористического разнообразия высших сосудистых растений памятника природы «Косы Долгой» (Ейский р-н). На основании изучения степных, литоральных и антропогенно измененных сообществ установлено флористическое разнообразие косы Долгой, включающий 133 вида растений. Приведены данные по таксономической структуре флоры, встречаемости видов, численности редких видов растений. Фитоценозы на «Косе Долгой» подвержены значительному антропогенному воздействию, что требует развития регламентированного устойчивого рекреационного природопользования.

Ключевые слова: «Коса Долгая», редкие виды, литораль, биоразнообразие, Восточное Приазовье, ООПТ.

Introduction

Currently, the national project “Ecology” as the preservation of the existing, and the search for ways to restore and increase of biodiversity, is especially relevant in connection with the UN goals in the field of sustainable development, the development of environmental policy of the Russian Federation and the Krasnodar Territory. The territories originally inhabited by humans, including river valleys and sea shores through which trade routes passed, are vulnerable. The North-Eastern Azov region (“Dolgaya Spit” (including protected areas)) belongs to such a zone. Today vast territories are occupied by human recreational facilities (various campgrounds and touristic centers). It has extremely negative consequences, because of their number increase (the development of infrastructure, the construction of recreational centers and campgrounds, the cleaning of beaches from plants, the transferring soil during construction). The number of vacationers and an increase in their anthropogenic impact has an influence on (the driving on unequipped sandy roads, the mechanical damage to plants, trampling). The above-mentioned affects the growing conditions of local flora species, among which there are representatives of rare, Red Book species. The fence of shell rock and sand greatly influenced the environment. As a result, artificial lake-pits were formed and altered floristic formations grew next to them.

The aim of the work is to establish the floristic diversity of the natural monument “Dolgaya Spit”. The studies were carried out in the summer period (June-August, 2021) [1]. The generally accepted methods of route and geobotanical research were used. In total, 250 herbarium plant samples were collected, 17 geobotanical descriptions were made, 5 communities were mapped (including steppe, littoral, the most anthropogenic altered vegetation areas, an artificial quarry that became a reservoir after the construction of shell rock fence. The community was almost destroyed on the side of the spit, where many beaches were put.

Landscape nature monument “Dolgaya Spit” was approved by the decision of the Krasnodar regional executive committee № 326 dated July 14, 1988 with the aim of preservation of unique landforms and natural landscapes, protecting places of concentration of various bird species and protecting 4 plant species included into the Red Data Books of the Russian Federation and the Krasnodar Territory [6]. Dolzhanskaya stanitsa is located in the southeastern part of the spit.

The description of the research

On the territory of the protected areas, any economic activity that may damage natural complexes and components is prohibited: 1) the allocation of land plots for capital construction (which was violated during the construction of the bases), 2) any types of economic and other activities that impede the preservation, restoration and reproduction of natural complexes. The territory of the spit is divided into a special protection zone and a zone of permitted use of natural resources (Fig. 1).

Figure. 1. Plan-scheme of the Protected area "Dolgaya spit"

According to the published data, the species diversity of the entire flora of the coastal ecosystems of the Sea of Azov consists of 1920 species of vascular plants [2], the "Dolzhanskaya Spit" – 189 species of plants [4, 5], including 19 protected species [3].

Our research on the flora inventory showed its composition in number of 133 species referring to 44 families. The largest number of species is *Asteraceae* (17) and *Poaceae* (16), *Fabaceae* (10), which is due to the location of this spit in the northern zone of steppe vegetation types (Fig. 2).

Figure. 2. The ratio of species on families collected on the "Dolgaya spit"

Figure. 3. The occurrence of species on the sample plots in the Protected area "Dolgaya spit"

The diagram (Fig. 3) shows the indicators of the species occurrence. The rare littoral species *Crambe maritima* L. (10.3%), distributed throughout the territory of the spit, has the highest occurrence. The second place is occupied by the steppe species *Medicago falcata* L. (9%), *Linaria genistifolia*, and *Eryngium campestre*, which is associated with the high distribution of steppe communities on this spit. The last place is occupied by *Reseda lutea* L., *Lepidium ruderae*, *L. Arenaria uralensis* Pall. ex Spreng 0.6% each species.

Particular attention was paid to the study of rare plant species. It should be noted that, in comparison with the data of other spits of the Azov coast, the rare gene pool is characterized by low indicators, both in terms of the total number of species found and their abundance. In total, five rare species have been recorded, of which only one *Crambe maritima* is characterized by widespread distribution. *Ephedra dystachia* is found in spots in the middle steppe part. The remaining species are represented only by single local populations. So, *Sakile euxina* was registered in the amount of 15 individuals on the territory of “The Rosa Vetrov” camp site, *Gypsophila perfoliata* in the amount of 20 individuals on the territory of the beach of “The Rosa Vetrov” recreational center, *Eryngium maritimum* was found in a single copy on the beach near the touristic center.

Conclusion

Thus, it should be stated that the taxonomic structure and composition of the flora correspond to the patterns of development and functioning of natural littoral and steppe natural complexes of the coastal zone of the Sea of Azov. Rare species, for the conservation of which this Protected area was established and recorded. However, their low numbers are alarming. The areas with a developed recreational infrastructure, a transport network of sandy roads, parking lots without the necessary coverings lead to the development of large-scale transformed areas with destroyed vegetation cover and to the development of synanthropized communities. Intensive recreational activities on the territory of protected areas are carried out without complying with the requirements of environmental legislation. The flow of recreants is not regulated by the recreational capacity of littoral ecosystems. It is necessary: 1) to regulate the delimitation of the special protection zone from the recreational territory, where recreational activities are possible, taking into account environmental standards, 2) to develop recreational development plans to ensure the environmental safety of coastal areas.

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Ecological State of the SPNA «Sudzhuk Lagoon»**

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Abstract

The article examines the current ecological situation in the lagoon, as well as the changes caused by anthropogenic impact. The dynamics of tourists and the dynamics of vehicles in the