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Orchids of Buzuluk pine forest in South-east of European Russia: diversity and conservation issues

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Abstract

The data on orchid diversity of Buzuluk pine forest located in the South-east of European Russia on the border of steppe and forest-steppe zones have been summarised and updated. The occurrence of 12 Orchidaceae species can be reliably confirmed for this territory. This collection of species could be regarded as unique for such climatic and geographical conditions. Such a variety of orchids within the same Anatural site cannot be found anywhere else in Orenburg region, and in Samara region there are only few of similar locations. About half of the orchid species indicated for Orenburg and Samara regions are found in Buzuluk pine forest. *Hemipilia cucullata* and *Hammarbya paludosa* on the territory of Orenburg region and *Corallorhiza trifida* on the territory of Samara region are known only from Buzuluk pine forest. All the orchids found there are included in IUCN Red List. Four species are listed in Red Data Book of Russian Federation. Most of the species (except *Epipactis helleborine*) are in the regional Red Data Books, making up more than half of all protected species for each region. Orchids occur in localities near residential areas, in places visited by tourists, in the utility zone of the national park (where logging is carried out or may be carried out), in locations with unstable water regime, which may threaten their survival on this territory. All the orchids found in this woodland have at least one locality on the territory of Buzuluk Pine Forest National Park. The problems of the orchid conservation can be attributed to the insufficient knowledge of their populations (number, density, etc.), and the intensive development of oil production, tourism and recreation over the last decade.

Key words: national park, oil production, Orchidaceae, rare species, Red Data Book.

Introduction

Orchids are the second largest flowering plant family and of major conservation concern globally due to their high ratio of threatened genera and high number of threatened species (Swarts and Dixon 2009, Efimov 2010, Chase et al. 2015, Wraith and Pickering 2018, Wagner et al. 2021). Orchids occur on all continents except Antarctica, but most species are confined to tropical and subtropical zones. The flora of temperate countries usually comprises about 50–100 representatives of this family, 139 species are found in Russia (Efimov 2022). In most cases, orchid extinction is caused by the loss of habitats as a result of direct human

impact, and less so by plant collecting or climate change. (Efimov 2010, Koopowitz and Hawkins 2012, Seaton et al. 2013, Dix and Dix 2015, Go et al. 2020). The features of orchid ecology and biology amplify the effect of negative external impact, which results in a particularly high percentage of endangered species in this family (Efimov 2010).

Orchids are widely represented in Red Data Books of Russian Federation and all regions (Averyanov 2000, Efimov 2020). Around 60 % of the species occurring in Russia are listed in it (Bardunov and Novikov 2008), which is considerably higher than the similar indicators for other large families (Efimov 2010).

The hotspots of orchid flora warrant significant attention from scientists, conservation agencies and local stakeholders. By analysing geographic attributes associated with orchid hotspots, including environmental factors related to their distribution can be identified and explored to understand ecological relationships, identify suitable habitats and organise conservation (Crain and Fernández 2020). For the South-east of European Russia, such a hotspot is Buzuluk pine forest, thus studies of orchid distribution and conservation on its territory is of high relevance.

Records of some orchid species occurrence in Buzuluk pine forest, based on preserved herbarium specimens, date back to the late XIX and early XX century. Floristic reports and inventory lists (Kin 2009) compiled, as well as data on orchid diversity (Ryabinina 1998, Kin and Kalmykova 2002, Stetsuk 2009, Kin 2015) contained incomplete, partially erroneous and unconfirmed information.

The main purpose was to study orchid diversity, distribution, and to assess the problems and prospects of their conservation. The objectives were to: (1) summarise data on orchid diversity in Buzuluk pine forest; (2) consider the ecobiological and geographical composition of orchid species as a factor of sustainability; (3) identify possible threats to orchids and their conservation problems.

Materials and Methods

Buzuluk pine forest is located on the south-eastern edge of the Russian Plain, on the territory of Samara and Orenburg regions (Fig. 1). The area is 1111.18 km^2. Currently, most of its territory (1067.8878 km^2) is part of Buzuluk Pine Forest National Park established in 2007. The lands not included in the national park belong to residential areas, oil and gas production facilities, public roads, etc. (Chibilev 2008).

The complexity of the relief and landscape structure of Buzuluk pine forest defines the diversity of habitats on its territory (Kin 2009). Surface and underground waters have a great impact on the formation of the vegetation diversity. The hydrographic network of the pine forest and its surroundings comprises Samara River, its tributaries and numerous oxbow lakes in its floodplain. The main waterway crossing the pine forest is its tributary – Borovka River. Its banks form cliffs of high floodplain, less often the first and second floodplain terraces are covered with ancient dunes (Chibilev 2008).

Over the past few decades, Buzuluk pine forest as a whole has been exposed to various types of human activities. Before the establishment of the national park (in 2007), large-scale logging, geological exploration and oil production (first started in the second half of the XX century and resumed in 2015) were carried out on its territory, wild fires were also quite common

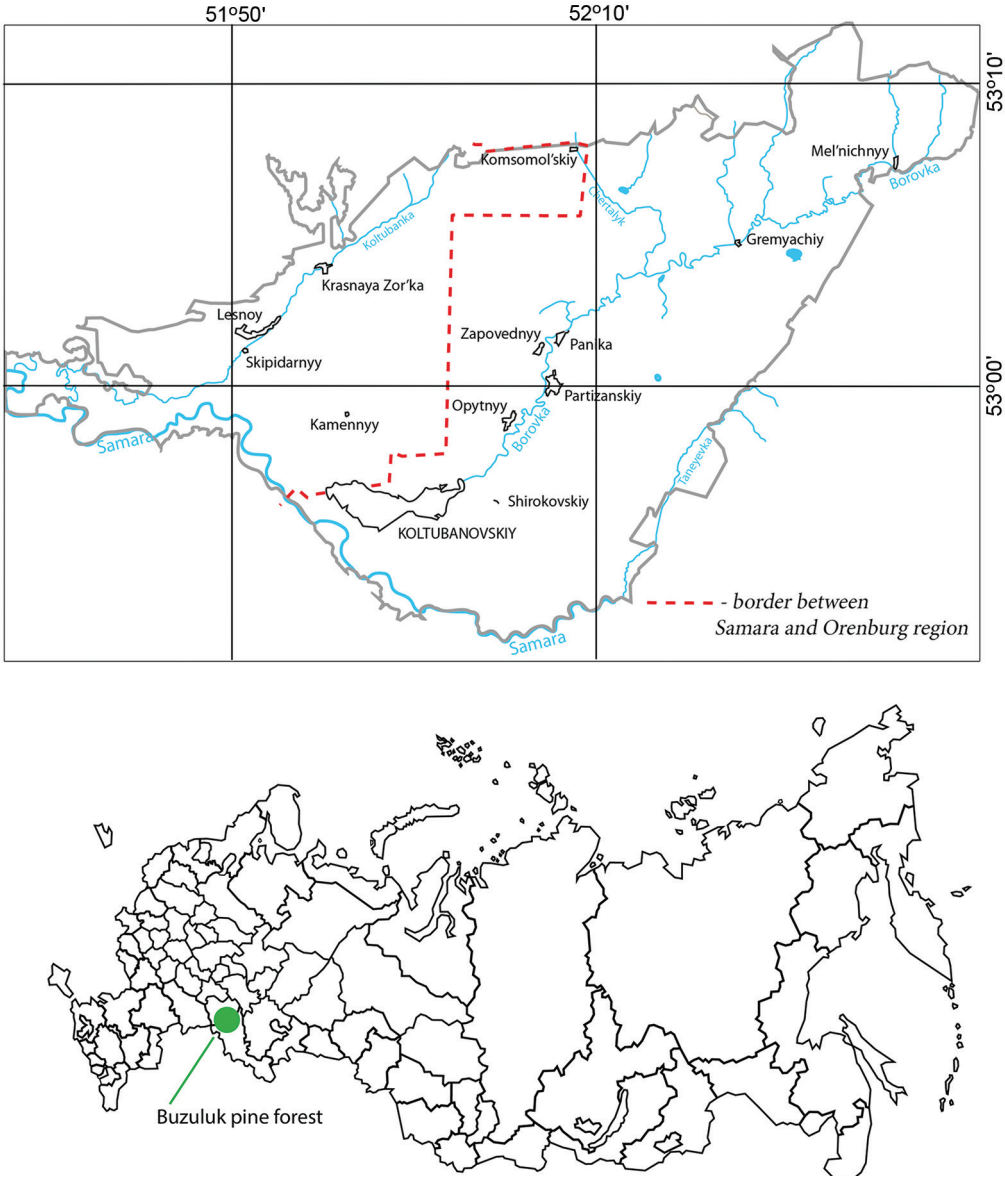

Fig. 1. Location of Buzuluk pine forest.

(Velmovsky and Chibilev 2019). Upon the establishment, the woodland included in its territory was divided into functional zones, and the impact of the above-mentioned factors has been reduced. However, there has been a significant increase in the impact of recreational and tourist activities, and urban development (often spreading beyond the borders of residential areas). The combined effects of natural and anthropogenic factors have resulted in the change (mainly decrease)

of groundwater level, river water content and, consequently, the moisture supply of orchid habitats in the forest.

The floristic survey of Buzuluk pine forest was conducted using the route method from 2000 to 2022. Sample collection and observations cover the entire territory of the woodland, including various types of habitats: meadows, floodplains, swamps, pine forests (both natural and plantings), broad-leaved woods, glades and forest fringes, dune slopes, residential areas and their surroundings, oil production sites (the old ones adjacent to suspended wells and new ones prepared for operation), transport routes between them and the surrounding area, sites of long-time burnt and logged forest. Herbarium specimens are stored in the collection of the Institute for Steppe Research of the Ural Branch of the Russian Academy of Sciences (ORIS). Archival materials were used (Anonymous 1927; Bulavkina-Onchukova 1935, 1938), as well as herbarium collections of: the Institute for Steppe Research of the Ural Branch of the Russian Academy of Sciences (ORIS), including the collection of the early XX century, contributed by Borovaya Forest Experimental Station, Komarov Botanical Institute of the Russian Academy of Sciences (LE), Lomonosov Moscow State University (MW), Lenin Moscow State Pedagogical University (MOSP), Kirov Saint Petersburg Forestry Academy. (KFTA), Penza State University (PKM), Nikitsky Botanical Garden (YALT).

The identification of potential threats to species in the surveyed territory was based on information from Red Data Books (Bardunov and Novikov 2008, Senator and Saksonov 2017, Belov 2019, IUCN 2020), as well as the analysis of the locality distribution in Buzuluk pine forest and threats presented. Wild fires, oil production, recreation, etc. are regarded as multifaceted threats that might have both a direct (habitat destruction) and indirect (habitat transformation) impact. The names of plant species are given according to The International Plant Names Index (Royal Botanic Gardens Kew 2022). IUCN Red List (IUCN 2020), Red Data Book of Russian Federation (Bardunov and Novikov 2008), Red Data Book of Orenburg Region (Belov 2019), Red Data Book of Samara region (Senator and Saksonov 2017) were used to characterise the species conservation status. Types of root systems and species geographical groups are presented according to Efimov (2022), species groups in relation to moisture content as well as ecocoenotic groups are given according to Kin (2009).

Results

Taxonomic diversity

For Buzuluk pine forest, different researchers (Yanishevsky 1898; Anonymous 1927; Sukachev 1931; Onchukova-Bulavkina 1935, 1938; Vasiliev 1998; Plaksina 1998, 2001; Matveev et al. 1999; Simonova 2001; Zadulskaya et al. 2002; Kin and Kalmykova 2002; Kin 2009; Ryabinina and Knyazev 2009; Stetsuk 2009; Korchikov et al. 2010; Saksonov and Senator 2012; Kin 2015; Kalmykova and Kin 2017; Belov 2019) indicated 22 species belonging to the Orchidaceae: *Cephalanthera rubra* (L.) Rich., *Corallorhiza trifida* Chatel., *Cypripedium calceolus* L., *C. guttatum* Sw., *C. macranthos* Sw., *C.* × *ventricosum* Sw., *Dactylorhiza majalis* ssp. *baltica* (Klinge) H.Sund., *Dactylorhiza cruenta* (O.F.Müll.) Soó, *D. incarnata* (L.) Soó, *Epipactis helleborine* (L.) Crantz., *Epipogiuma phyllum* Sw., *Goodyera repens* (L.) R.Br., *Gymnadenia conopsea* (L.) R.Br., *Hammarbya paludosa* (L.) Kuntze, *Her-*

minium monorchis (L.) R.Br., *Liparis loeselii* (L.) Rich., *Malaxis monophyllos* (L.) Sw., *Neottia ovata* (L.) Bluff & Fingerh., *N. nidus-avis* (L.) Rich., *Orchis militaris* L., *Platanthera bifolia* (L.) Rich., *Hemipilia cucullata* (L.) Y.Tang, H.Peng & T.Yukawa. More than half of these reports have been confirmed by herbarium materials and our current findings.

The data on the occurrence of seven species is doubtful: *Cypripedium guttatum*, *C. macranthos*, *C. × ventricosum*, *Epipogium aphyllum*, *Goodyera repens*, *Liparis loeselii*, *Malaxis monophyllos*. The occurrence of *Cypripedium macranthos*, *Epipogium aphyllum*, *Liparis loeselii* in Buzuluk pine forest is indicated in Red Data Book of Orenburg region (Vasiliev 1998), however, the analysis of the source material has revealed that there is no information confirming the occurrence of these species exactly in the forest. *Cypripedium guttatum*, *C. macranthos*, *C. × ventricosum*, *Epipogium aphyllum*, *Liparis loeselii*, *Goodyera repens* and *Malaxis monophyllos* are listed for the flora of Buzuluk pine forest (Stetsuk 2009) as questionable 'species indicated in the literature (without specifying sources of information), but not found in the course of field surveys'.

Two species, *Herminium monorchis* and *Dactylorhiza baltica* were misidentified and subsequently re-identified – the former as *Hammarbya paludosa*, and the latter as *D. incarnata*. We accept *Dactylorhiza cruenta* as *D. incarnata* (L.) ssp. *cruenta* (O.F.Müll.) P.D.Sell and consider it together with *Dactylorhiza incarnata*.

Thus, based on the results of our field survey and the analysis of literary, archival and herbarium materials, the occurrence of 12 Orchidaceae species can be reliably confirmed for Buzuluk pine forest: *Cephalanthera rubra*, *Corallorhiza trifida*, *Cypripedium calceolus*, *Dactylorhiza incarnata*, *Epipactis helleborine*, *Gymnadenia conopsea*, *Hammarbya paludosa*, *Neottia ovata*, *N. nidus-avis, Orchis militaris*, *Platanthera bifolia*, *Hemipilia cucullata.*

Ecobiological and geographical analysis

Most of the orchids growing in Buzuluk pine forest are polycarpics (11 species) and only one (*Neottia nidus-avis*) is a perennial monocarpic. In terms of the type of root system, rhizomatous species predominate (6 species: *Cephalanthera rubra, Corallorhiz atrifida, Cypripedium calceolus, Epipactis helleborine, Neottia nidus-avis*, *N. ovata*), tuberoids are typical of 5 species (*Dactylorhiza incarnata, Gymnadenia conopsea, Orchis militaris, Platanthera bifolia*, *Hemipilia cucullata*) one species has a pseudobulb (*Hammarbya paludosa*).

In relation to moisture content, among the orchids of Buzuluk pine forest, species of mesophytic fraction are prevalent – mesophytes (7 species: *Cephalanthera rubra*, *Cypripedium calceolus, Gymnadenia conopsea, Neottia ovata, N. nidus-avis, Platanthera bifolia, Hemipilia cucullata*) and hygromesophytes (3 species: *Dactylorhiza incarnata*, *Epipactis helleborine*, *Orchis militaris*). Only a species belongs to mesohygrophytes (*Corallorhiza trifida*) and hygrophytes (*Hammarbya paludosa*). In ecophytocoenotic terms, forest (*Cypripedium calceolus, Neottia ovata, N. nidus-avis, Hemipilia cucullata*) and forest-fringe (*Cephalanthera rubra, Epipactis helleborine, Gymnadenia conopsea, Platanthera bifolia*) species predominate, there is one in the forest-fringe–meadow (*Orchis militaris*), marsh-meadow (*Dactylorhiza incarnata*), marsh-forest (*Corallorhiza trifida*) and marsh (*Hammarbya paludosa*) groups (Fig. 2).

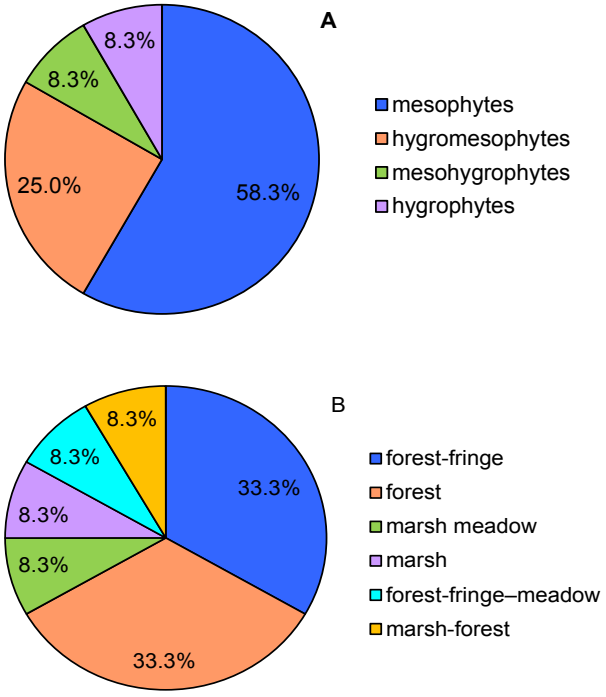

Fig. 2. Orchidaceae species spectrum of Buzuluk pine forest in relation to moisture content (A) and ecocoenotic spectrum (B).

Most of the geographical spectrum of Orchidaceae in Buzuluk pine forest is represented by Eurasian boreal-nemoral species (*Cephalanthera rubra, Cypripedium calceolus*, *Dactylorhiza incarnata, Epipactis helleborine, Gymnadenia conopsea, Neottia ovata, N. nidus-avis, Orchis militaris, Platanthera bifolia, Hemipilia cucullata*), 2 species belong to the mountain-boreal group (*Hammarbya paludosa*, *Corallorhiza trifida*).

Threats and conservation problems

Out of 12 species of orchids growing in Buzuluk pine forest, 5 were noted not only within the boundaries of the national park, but also in the territory allocated for oil production and its infrastructure: *Cypripedium calceolus, Hemipilia cucullata, Epipactis helleborine, Neottia nidus-avis, Platanthera bifolia*. Among them, *Cypripedium calceolus* and *Hemipilia cucullata* are of the greatest concern. They are less common in the pine forest and rarer in the regions than *Epipactis helleborine, Neottia nidus-avis, Platanthera bifolia*.

At the same time, all the orchids found within this woodland have localities on the territory of Buzuluk Pine Forest National Park (Table 1).

The localities of *Cephalanthera rubra* are found near residential areas where they are affected by grazing, recreation and tourism; on logging sites in the utility zone of the national park, on the site with an unstable water regime. Only the herbarium specimen (1885) indicates the occurrence of *Corallorhiza trifida* in Buzuluk pine forest. According to the existing unspecified indication of the species locality, it presumably occurs in the utility or recreational and tourist zones of the national park. The most significant limiting factors for *Cypripedium calceolus* in Buzuluk pine forest include: recreational impact, changes in coenotic conditions (the species occurs in areas with unstable water regime), collecting for bouquets, forest exploitation. The populations of *Dactylorhiza incarnata* and *Orchis militaris* are mainly impacted by changes in habitat conditions, mainly moisture, since

Table 1. Distribution of orchids by functional zones of the national park.

Species	Functional zone of Buzuluk Pine Forest National Park
Cephalanthera rubra	protected, utility
Corallorhiza trifida	utility, recreational and tourist
Cypripedium calceolus	reserved, protected, utility
Dactylorhiza incarnata	reserved, protected, utility
Epipactis helleborine	all zones
Gymnadenia conopsea	reserved, utility
Hammar byapaludosa	reserved
Hemipilia cucullata	reserved, recreational and tourist
Neottia nidus-avis	all zones
Neottia ovata	reserved, protected, utility
Orchis militaris	reserved, recreational and tourist
Platanthera bifolia	all zones

the species occurs in places with a sharp fluctuation in moisture content. In a locality, forest is occupying meadow. The species is noted on areas actively visited by people for recreation and tourism, in grazed areas near the village. For *Epipactis helleborine*, the major threats in Buzuluk pine forest are recreation and tourism, urbanisation, and oil production. *Gymnadenia conopsea* is threatened by the change in water regime, recreation and tourism. *Hammarbya paludosa* was found in Buzuluk pine forest in only one locality in the reserved zone of the national park, however, this habitat is characterised by an unstable water regime. *Neottia nidus-avis* is affected by forest exploitation, recreation and tourism. *Platanthera bifolia* was spotted in areas where a change in habitat conditions (moisture content, light regime) is likely to happen or already is taking place. This species is also exposed to recreational and tourist activities and logging. *Hemipilia cucullata* is very rare in Buzuluk pine forest, and currently oil production poses the most serious threat to this species, since one of its localities is on the transport route between industrial sites, and a road construction, if implemented, might change the light regime of the habitat. Another locality is in the recreational and tourist zone of the national park, and this may also threaten the species conservation.

Wild fires are one of the most serious potential threats to all the orchids of Buzuluk pine forest due to the high fire risk on the territory because of arid conditions. Thanks to the organisation of an effective warning and fire extinguishing system, today fires are rare in the national park. However, since the preparation for oil production is in progress and production processes are about to start in the future, fires become one of the most probable risks that cause concern for the safety of orchids.

Eleven of the 12 orchid species found in Buzuluk pine forest belong to LC (Least Concern) category of IUCN Red List (IUCN 2020), one species belongs to EN (Endangered) category (Table 2). The number of most species is estimated as decreasing. Four species are listed in the Red Data Book of the Russian Federation (Bardunov and Novikov 2008). All of them have the status of 3 – rare species. Ten of the 17 species in Red Data Book of Oren-

Table 2. Conservation status of orchid species.

Species name	IUCN Red List (2020)	Red Data Book of Russian Federation (2008)	Red Data Book of Samara region (2017)	Red Data Book of Orenburg region (2019)
Cephalanthera rubra	LC/decreasing	rare	rare	endangered
Corallorhiza trifida	LC/unknown	-	-	endangered
Cypripedium calceolus	LC/stable	rare	rare	endangered
Dactylorhiza incarnata	LC/decreasing	-	rare	rare
Epipactis helleborine	LC/decreasing	-	-	-
Gymnadenia conopsea	LC/decreasing	-	rare	vulnerable
Hammarbya paludosa	LC/declining	-	endangered	-
Neottia ovata	LC/unknown	-	endangered	vulnerable
Neottia nidus-avis	LC/decreasing	-	rare	rare
Orchis militaris	LC/decreasing	rare	rare	vulnerable
Platanthera bifolia	LC/decreasing	-	rare	rare
Hemipilia cucullata	EN/decreasing	rare	endangered	endangered

Note: LC – Least Concern, EN – Endangered.

burg region and ten of the 18 species of the Red Data Book of Samara region occur in the pine forest. In Red Data Book of Orenburg region, the conservation status of species is often stricter than in Red Data Book of Samara region. The view on the rarity of *Cephalanthera rubra* differs the most. The species is considered as endangered in Orenburg region and as rare in Samara region.

Discussion

Orchids are a family more common for tropical and subtropical latitudes, while the temperate zone is inhabited by a few species, mainly with extensive ranges. Orchid species are unevenly distributed over Russia. Arid and Arctic areas are characterised by a minimum number of orchid species, whereas afforested zones, especially humid subtropical regions, by a maximum number (Efimov 2020, 2022). Buzuluk pine forest is located on the border of steppe and forest-steppe zones, that is, in the area with moisture deficit. Orchids in these zones (including Samara and Orenburg regions), as a rule, are rare finds (Saksonov and Koneva 2006, Saksonov and Senator 2012, Efimov 2020). However, 1/3 of Orchidaceae species indicated for Volga region and about half of the orchids of regional floras occur within this forest alone. Such a number of orchid species in the surveyed territory is determined by local conditions. The natural conditions of Buzuluk pine forest and the history of its formation gave rise to a wide range of habitats on its territory that allowed the formation of an original flora. The diversity of habitats suitable for Orchidaceae species (the ratio of disturbed areas, pastures, hayfields and meadows, forests and wetlands) is known to have a great impact on the taxonomic diversity of this family (Kull et al. 2016). It may well be argued that such a variety of orchids within the same natural site is unique for Orenburg region, and in Samara region

there are only few of similar locations. *Hemipilia cucullata* and *Hammarbya paludosa* in Orenburg region and *Corallorhiza trifida* in Samara region are known only from Buzuluk pine forest. At the same time, almost all the orchids found in the surveyed area, except *Cephalanthera rubra*, are characterised by Efimov (2022) as 'widespread' in Russia.

Orchids are exposed to many factors that limit their distribution in the natural environment. These include both natural habitat changes and the loss of suitable biotopes as a result of human impact and direct destruction (for example, collecting for ornamental, medicinal purposes) (Soto Arenas et al. 2007, Vakhrameeva et al. 2008, Seaton et al. 2013, Le Roux et al. 2019), and recently climate change is also mentioned (Liu et al. 2010, 2015; Seaton et al. 2013; Efimov 2022). The features of orchid biology make them vulnerable to direct and indirect human impact (Soto Arenas et al. 2007). The main factors threatening the growth and spread of orchids in Buzuluk pine forest include oil production, recreation and tourism, natural and artificial transformation of habitats.

As in Russian flora of orchids in general, in Buzuluk pine forest Eurasian boreal-nemoral species predominate. These species are currently moving north and east as a result of climate change, namely warming and aridisation (Efimov 2022). Therefore, these species deserve close attention and regular monitoring since they can serve as a marker of the dynamics of abiotic (including climatic) changes.

The forest species of Orchidaceae more often belong to species with a stable and growing number of localities. Only a small part of forest orchids is confined to intact woodlands, whereas most species successfully exist in secondary small-leaved forests. Among the species with a decreasing number of localities, meadow-forest-fringe species are indicated (Efimov 2022). The predominance of forest species among the orchids of Buzuluk pine forest allows to consider this species collection as relatively stable. The meadow-forest-fringe group is represented in Buzuluk pine forest by *Orchis militaris* which, by the data of Efimov (2022), widely demonstrates an increase in the number of Russian localities.

It was proved by Kull et al. (2016) that tuberous orchids are significantly more vulnerable to the effects of limiting factors than rhizomatous taxa. Efimov (2022), using the example of orchids in Russia, showed that among species with a decreasing number of locations, tuberoid species predominate, while among species with a growing number of locations their proportion is minimal. On the contrary, the proportion of species with a pseudobulba is highest in the group of species with a growing number of locations. Among the orchids of Buzuluk pine forest, rhizomatous species, which are more resistant to external conditions, prevail; the threat of reduction in the number of locations (considering the type of root system) is higher in *Dactylorhiza incarnata, Gymnadenia conopsea, Orchis militaris, Platanthera bifolia, Hemipilia cucullata*.

The survival of orchids is possible only under minimal human impact or upon condition of precise management of orchid habitats in urbanised and/or populated areas out (Khapugin 2020). One of the tools to control and minimize human impact on rare species (including orchids) are Red Data Books. All the orchid species found in Buzuluk pine forest are listed in IUCN Red List (IUCN 2020), 4 in Red Data Book of Russian Federation (Bardunov and Novikov 2008), 10 in the regional Red Data Books. Thus, each species of

the studied group is protected by its status in Red Data Book at the global, federal or regional level. However, this approach to conservation of floral diversity is not efficient enough and should be combined with habitat protection.

Due to the natural transformation of some orchid biotopes, there are species that require a resumption of traditional farming methods to preserve their habitats (IUCN 1996). In Buzuluk pine forest, such species are *Orchis militaris* and *Dactylorhiza incarnata*. They have formed large, well-developed coenopopulations here that were preserved for a long time thanks to mowing. Currently, however, this habitat is being occupied by forest, which leads to a sharp reduction in the number of species. To prevent its decline, it is suggested to carry out a single mowing in the second half of summer (after fruit inception) to reduce competition from neighbouring species and to increase the illumination of the habitat.

Protected areas are considered the most effective effort to protect characteristic or threatened species, habitats and ecosystems and to counteract the biodiversity loss (Geldmann et al. 2013, Coetzee et al. 2014, Gray et al. 2016, Khapugin 2020). Considerable attention is paid to the study of the diversity, ecology and dynamics of orchid coenopopulations in such territories (Ishmurzina and Barlybaeva 2008, Lesina 2009, Nalimova 2010, Tsiftsis and Tsiripidis 2015, Kuznetsova et al. 2018, Baro et al. 2019, Gladkova and Sibirina 2019, Dikareva and Tarasova 2021). Almost all the orchids found in Buzuluk pine forest, except *Cephalanthera rubra* and *Corallorhiza trifida*, have at least one locality in the reserved zone of Buzuluk Pine Forest National Park, and they can be considered safe from direct destruction and the most common forms of human impact as long as the established here regime is strictly compiled with.

The problems of orchid conservation in Buzuluk pine forest can be attributed to the insufficient knowledge of their populations (abundance, density, etc.). The literature review showed that such data are available only for some localities of several species (*Platanthera bifolia, Hemipilia cucullata, Orchis militari, Dactylorhiza incarnata, Cypripedium calceolus*), mainly without dynamics description. Such data are found in the works of Stetsuk (2004, 2009); Stetsuk and Kin (2011).

Conclusions

Orchidaceae is represented in Buzuluk pine forest mainly by species that have the least threat of extinction on a global and national scale. These are mainly widespread species on the territory of the country. At the same time, a whole collection of orchid species is concentrated in one woodland, in the southern part of the range of orchids in Russia. This species collection can be regarded as unique for such climatic and geographical conditions. Taking into account current trends in the dynamics of species distribution in Russia, ecobiological and geographical spectra, it can be considered relatively resistant to possible external impacts and promising for conservation.

Currently, the inclusion of the species in the national and regional Red Data Books, as well as the status of a national park in most of the territory contributes to the preservation of this unique species collection.

On the basis of the available data on the distribution of orchids in the areas allocated for oil production, we recommended

the oil producing company to change the location of the facilities that might disturb orchid habitats. The recommendations were partially implemented. Owing to this, the localities of the rarest orchids in the area allocated for oil production have been preserved to the present. To minimize the impact of recreation and tourism, a more detailed survey of the recreational and tourist areas of the national park is recommended. At the same time, close attention should be paid to most-visited places. According to the results of the survey, it is necessary to optimize the functional zoning and limit the admission to the sites where orchids grow.

One of the important tasks is a more detailed study of orchid populations that will enable to optimize their protection. Observation of the dynamics of orchid populations in the south of their range can be used as a marker of global environmental changes.

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