

Floristic finds in the south-eastern part Altai Krai

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Many species of the Liliaceae family Juss. and Orchidaceae Juss. known not only as beautiful flowering plants, they also have medicinal, food, decorative and many other qualities. All this has long attracted human attention to daylilies and orchids, contributes to their extermination, which necessitates the protection. Expanding tourist and recreational development of the territory and economic activities also aggravate the process of reducing such plants. In this regard, the study of rare species of the family Liliaceae Juss. and Orchidaceae Juss. are relevant. The purpose of this work is to Supplement current data on the habitats of individual representatives of daylilies and orchids in the Altai territory. For the South-Eastern part of the region, new information is provided about 13 habitats of four rare plant species: *Hemerocallis lilio-asphodelus* L., *Cypripedium calceolus* L., *Cypripedium macranthos* Sw. and *Cypripedium ventricosum* Sw., information about which is not available in the third edition of the regional red book.

Keywords: Trazodne yellow day-Lily; shoes limestone, grandiflora, distended; Altai Krai, Yeltsovsky, Tselinny, Soltonsky districts.

Introduction

Altai Krai (Territory) is one of the regions of Russia that are developed in the agrarian, tourist and recreational respect; and mining is also developed here, which negatively affects biodiversity. Over many decades, economic activity contributed to the transformation of the region's original flora into anthropogenically transformed, including synanthropic fractions. Despite this, even in such conditions, the nature of the Altai Territory retains rich plant diversity. This is facilitated by various forms of natural ecosystems conservation, one of which is the inclusion of certain plant species in the regional Red Book. The last edition contains 141 species of flowering plants that need priority protection (Red Book of Altai Territory, 2016).

Daylilies and orchids, due to their beautiful and well-noticeable flowers, bring diversity to the landscapes and attract the attention of recreants who collect them in bouquets. Local areas of daylilies and orchids are also subject to the negative impact of amateur gardeners and collectors of exotic species, plants are put up for illegal sale, collected for medicinal and other purposes. Therefore, timely identification of new habitats of rare species of the families *Liliaceae* Juss. and *Orchidaceae* Juss. is necessary for their protection.

The purpose of this work is to supplement current data on the habitats of the representatives of daylilies and orchids in the Altai Territory.

Material and methods

The study of rare plants was carried out on the basis of generally accepted methods (Bychenko, 2008; Methods of field environmental research, 2014). In order to make an idea of the distribution of rare species of the families *Liliaceae* Juss. and *Orchidaceae* Juss. in the Altai Territory, an analysis of available sources was carried out, including materials from the 3rd edition of the Red Book of Altai Territory (2016), as well as the results of field expeditions of the authors in 2016–2020.

Results

For the southeastern part of the region, new information is presented on 13 habitats of 4 species of rare plants: *Hemerocallis lilio-asphodelus* L., *Cypripedium calceolus* L., *Cypripedium macranthos* Sw. and *Cypripedium ventricosum* Sw. Information about them is not available in the third (last) edition of the regional Red Book.

Discussion

H. lilio-asphodelus L. was recorded in the Red Book of Altai Territory (2016) with a status of 3b. Rare species. In the region, 25 locations of this plant were known. Daylily is protected in 2 specially protected natural territories (SPNA) – in the Kislukhinsky and Ob Reserves (Smirnov, 2016).

The characteristics of two new *H. lilio-asphodelus* habitats are given below (Fig. 1).

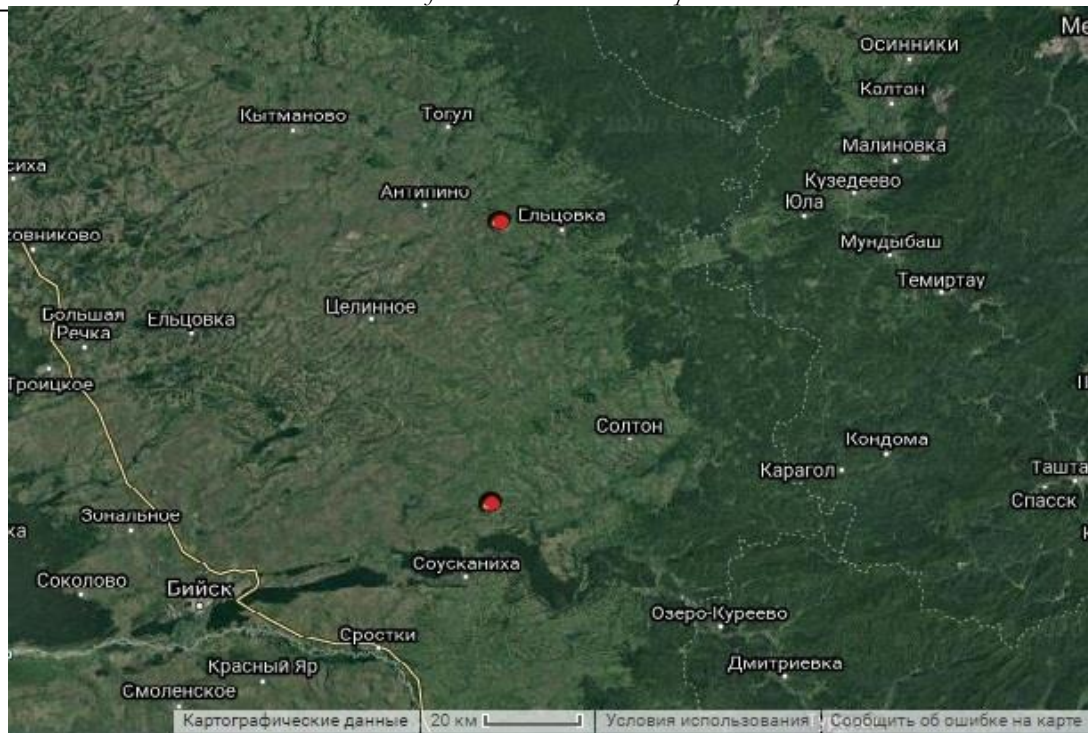


Fig. 1. Habitats of *Hemerocallis lilio-asphodelus* in the south-eastern part of the Altai Krai

1. In Yeltsovsky District (Fig. 2): 53°15'03.4"N 86°04'13.4"E. The absolute height is 263 m. The right bank of the Brazhikha river (the right tributary of the Chumysh river) in the upper reaches of its valley; 3.7 km (the nearest point) south-west of the Biysk-Novokuznetsk highway, 11 km west of the village Yeltsovka, 10 km east of the village Martynovo, 15 specimens *H. lilio-asphodelus* on an area of 20×30 m, flowering (08.06.2020). Some of the flowers were frozen on June 3 when at 6 a.m. the air temperature dropped to minus 2.5 °C, all plants were covered with hoarfrost. Later, after this slight freezing, daylilies resumed flowering.

The closest daylily population, according to Smirnov (2016), is in the Krasnogorsk district near the village Bystryanka, more than 100 km to the south.

2. In the Solton region: coordinates 52°41'17.6"N 86°02'46.1"E. The absolute height is 280 m. The population is logged on the port side in the upper reaches of the Sukhaya river (left tributary of the Chebashikha River). The border of the Solton and Biysk districts runs along the Sukhoi Valley. The right side is Biysk district, the left side is Solton. Over an area of 30×50 m, 12 specimens were found. *H. lilio-asphodelus*, flowering (15.05.2020).

In the Altai Territory, 27 species of the *Orchidaceae* Juss. family are known. (Sulimenkina et al., 2015), of which 11 are rare and protected (Red Book of Altai Territory, 2016).



Fig. 2. *Hemerocallis lilio-asphodelus*, Yeltsovsky district, Altai Territory, Russia, 08.06.2020. Photo by G.G. Rusanova.

C. calceolus L. is recorded in the Red Book of Altai Territory (2016) with a status of 3b. A rare species throughout the habitat. More than 10 locations with a population of 10-100 specimens are known in the region. It is protected in 5 reserves: Egorievsky, Aleusky, Kasmalinsky, Pankrushikhinsky, Kislukhinsky (Silantyeva, 2016).

The characteristics of the two identified habitats of *C. calceolus* are given below (Fig. 3).

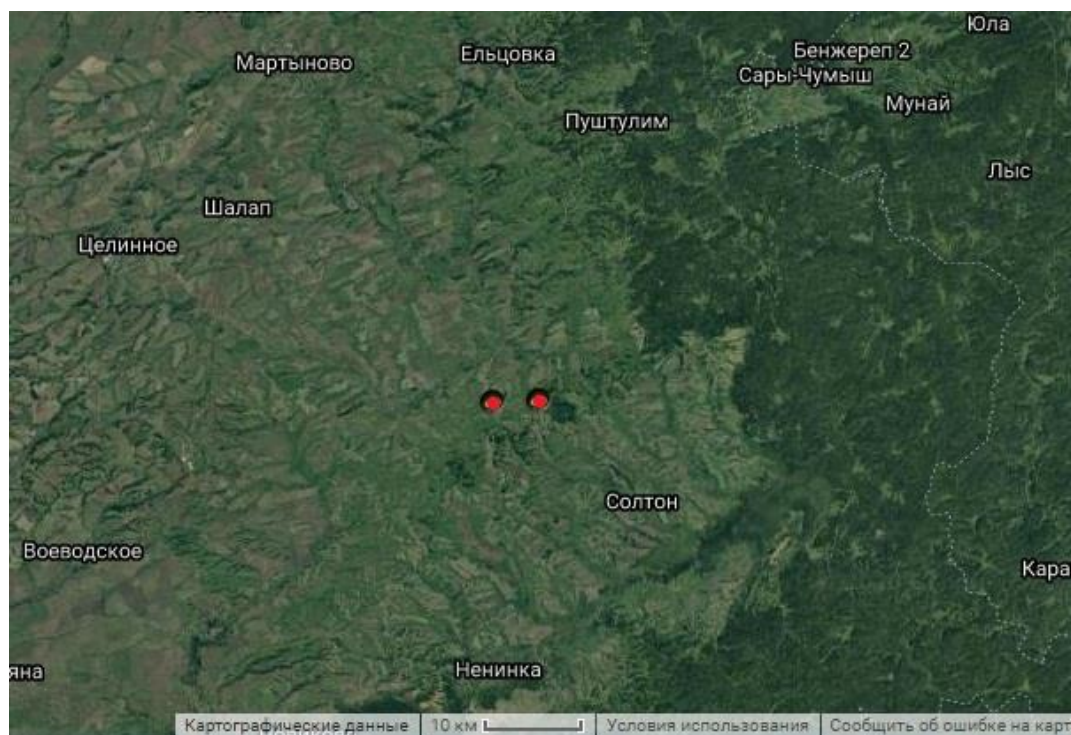


Fig. 3. Habitats of *Cyripedium calceolus* in the south-eastern part of the Altai Krai

1. In Tselinny district (Fig. 4): the coordinates of the central point of the section 52°55'27.9"N 86°18'44.4"E. The absolute height is 560 m. The population is located practically on the border of the Solton and Tselinny areas on the southeastern slope of the mountain Kivda. On an area of 50×200 m, 10 specimens were found, flowering (09.06.2019).



Fig. 4. *Cyripedium calceolus*, Tselinny district, Altai Territory, Russia, 09.06.2019. Photo by V.S. Ruzayeva.

The closest populations, according to Silantyeva (2016), are known in the Soloneshensky, Talmensky and Topchikhinsky areas, i.e. 100–200 km to the south and northwest.

2. In Tselinny district: coordinates 52°55'18.9"N 86°14'24.9"E. The absolute height is 400 m. The population is on the left side in the upper Kurlemesh river (the right tributary of the Soltonka River), 2 km east-southeast of the mountain Rudinskaya. In a clearing with an area of about 3 hectares, among other plant species, a group of *C. calceolus* of 45 specimens was discovered, flowering (11.06.2019).

C. macranthon Sw., a protected plant with a status of 3b. Rare species. Over 35 habitats are established in the region. Individual populations, depending on the growing conditions, are large, with dozens of simultaneously flowering specimens (Kislukhinsky nature reserve). In the region *C. Macranthon* is protected in 10 protected areas (Silantyeva, 2016), populations of these and other orchids are studied at monitoring sites in Kislukhinsky, Kasmalinsky and other reserves (Silantyeva, 2017; Silantyeva et al., 2019).

The characteristics of seven previously unknown *C. Macranthon* habitats are given below (Fig. 5).

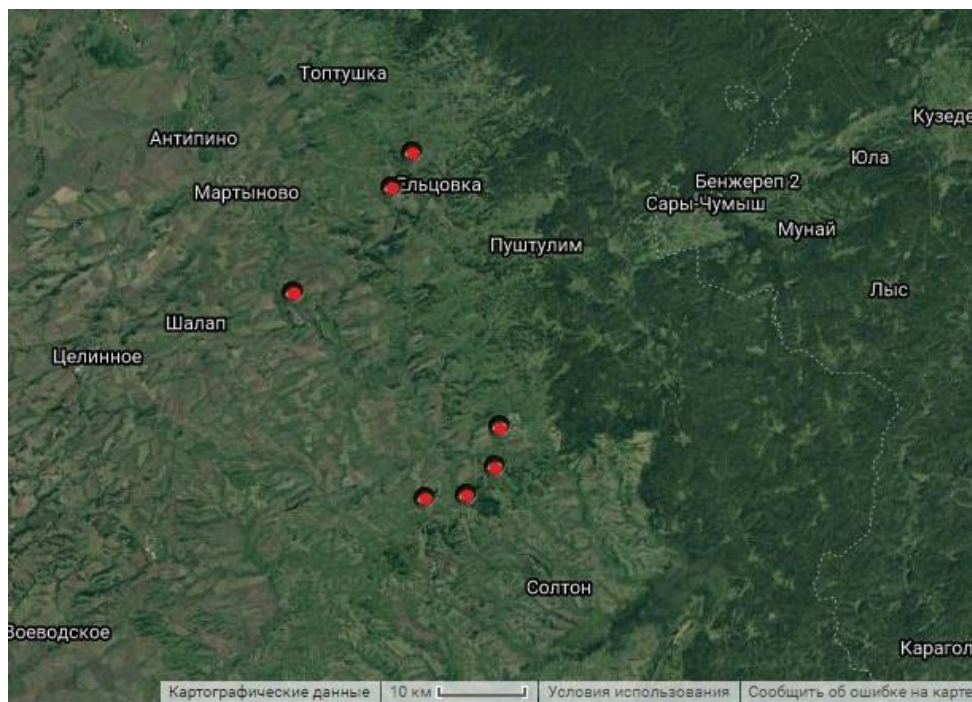


Fig. 5. Habitats of *Cypripedium macranthon* in the south-eastern part of the Altai Krai

1. In Tselinny district: coordinates 52°55'18.9"N 86°14'24.9"E. The absolute height is 400 m. The population is on the left side in the upper Kurlemesh river (the right tributary of the Soltonka River), 2 km east-southeast of the mountain Rudinskaya. On an area of about 3 ha, a group of 65 specimens was found among different plants. *C. Macranthon*, flowering (11.06.2019).

2. In Tselinny District: 52°08'35.0"N 86°02'25.8"E. The absolute height is 230 m. The right bank of the river Chumysh at the down river suburb of the village Pobeda. Here Chumonikha Creek flows into the Chumysh river. The population is located on the left side of the valley of this stream, 2 km from the mouth (in a straight line), 30 specimens *C. Macranthon* (Fig. 6), flowering (28.05.2020).



Fig. 6. *Cypripedium macranthon*, Tselinny district, Altai Territory, Russia, 28.05.2020. Photo by G.G. Rusanova.

3. In Yeltsovsky District: 53°14'40.1"N 86°10'51.9"E. The absolute height is 240 m. The confluence of the Cheremshanka River on the right into the Chumysh river between the villages of Yeltsovka and Cheremshanka. A population of *C. Macranthon* was found in the third large log, on the left side of the mouth of the Cheremshanka river, at least 100 specimens over 100 m, flowering (08.06.2020).

4. In Yeltsovsky District: 53°16'49.1"N 86°13'02.7"E. The absolute height is 250 m. The valley of the river Yeltsovka, 2.5 km northwest of the old traffic police post at the entrance to the Yeltsovka regional center, in the log on the left side of the river Yeltsovka valley in a population of 5 specimens *C. Macranthon*, flowering (07.06.2020).

5. In the Solton region: 5.5 km north-east of the mountain Kivda in the az. 55°, and 3 km north-east of the mountain Popovinskaya along the az. 60° at a distance of 8.5 km southeast of the village Popovichi. The gently sloping upper part of the northern slope of the nameless peak with an area of about 25 hectares. The coordinates of the angles of this surface: 52°57'18.4"N 86°21'43.1"E; 52°57'20.7"N 86°22'58.3"E; 52°57'37.3"N 86°21'45.8"E; 52°57'48.4"N 86°22'29.8"E. The absolute height is 480 m. About 400 specimens *C. macranthon* (Fig. 7), flowering (09.06.2019).



Fig. 7. *Cypripedium macranthon*, Solton district, Altai Territory, Russia, 09.06.2019. Photo by V.S. Ruzayeva.

6. In the Solton region: the coordinates of the central part of the site 52°55'33.4"N 86°18'36.2"E. The interval of absolute heights is 560–590 m. The border is with the Tselinny district, the southeastern slope of the mountain Kivda. 65 specimens were found on an area of 200 × 350 m. *C. macranthon*, flowering (09.06.2019).

7. The characteristics of the habitat in the Solton region: coordinates 52°59'46.9"N 86°22'11.0"E. The absolute height is 260 m. The population is on the left side of the valley of the river Dalnaya Poperechka (left tributary of the Kandalep River), 7.5 km east of the village Popovichi. The border of the districts runs along the valley of Dalnyaya Poperechka. The right side of the valley is Tselinny district, the left side is Solton. On an area of 5×10 m, 7 specimens were found. *C. macranthon*, flowering (24.05.2020). Earlier, we published materials on four more new habitats of *C. macranthon*, found from June 10 to June 18, 2016 in Tselinny district in the upper reaches of the river Angurep and not included in the latest edition of the Red Book of Altai Territory (2016) (Vazhov et al., 2017).

C. ventricosum Sw. Recorded in the Red Book of Altai Territory (2016) with a status of 3b. Rare species. In the region there are 6 known species locations with a population of more than 500 specimens. It is protected in the Kasmalinsky and Kislukhinsky reserves (Silantyeva, 2016).

The characteristics of two new found habitats of *C. ventricosum* are given below (Fig.8).

1. In the Solton region: 5.5 km north-east of the mountain Kivda in the az. 55°, and 3 km north-east of the mountain Popovinskaya along the az. 60° at a distance of 8.5 km southeast of the village Popovichi. The gently sloping upper part of the northern slope of the nameless peak with an area of about 25 hectares. The coordinates of the angles: 52°57'18.4"N 86°21'43.1"E; 52°57'20.7"N 86°22'58.3"E; 52°57'37.3"N 86°21'45.8"E; 52°57'48.4"N 86°22'29.8"E. The absolute height is 480 m. 97 specimens *C. ventricosum*, flowering (Fig. 9) (09.06.2019).

The nearest population, according to Silantyeva (2016), is known in the Talmensky district at a distance of more than 150 km.

2. In Tselinny district: coordinates 52°55'18.9"N 86°14'24.9"E. The absolute height is 400 m. The population is on the left side in the upper Kurlemesh river (the right tributary of the Soltonka River), 2 km east-southeast of the mountain Rudinskaya. A group of *Cypripedium ventricosum* of 47 specimens, flowering (11.06.2019) was found on a site of about 3 ha among different plant species.

Thus, new data on the habitats of *H. lilio-asphodelus* L., *C. calceolus* L., *C. macranthon* Sw. and *C. ventricosum* Sw. in the inaccessible southeastern part of the Altai Territory will be useful to supplement information on the distribution and number of populations in order to improve measures for their protection.

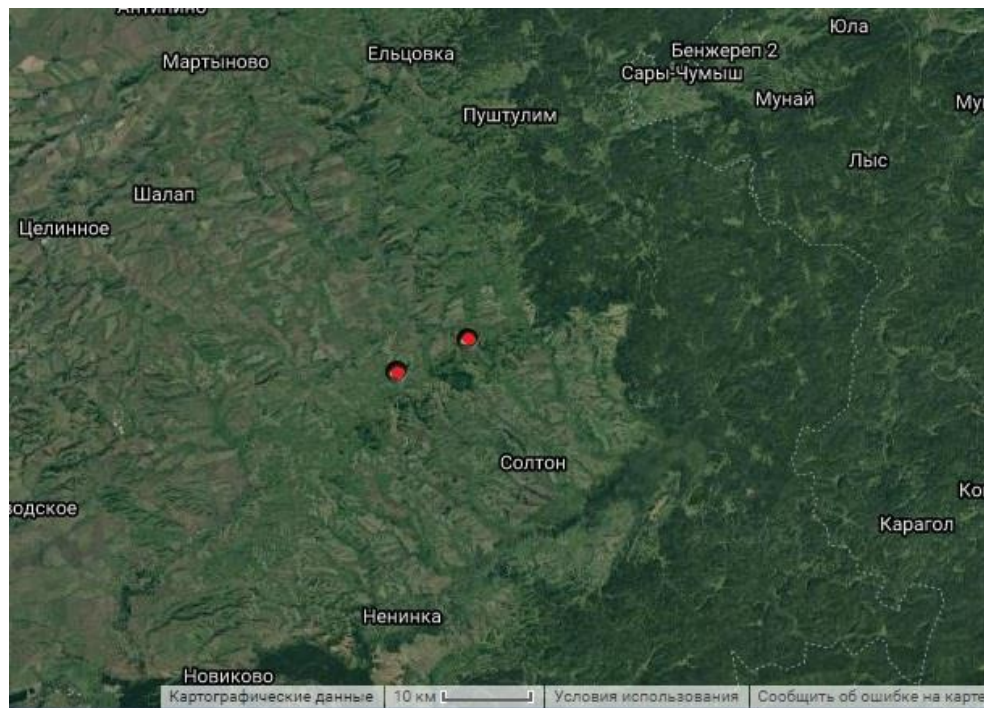


Fig. 8. Habitats of *Cypripedium ventricosum* in the south-eastern part of the Altai Krai



Fig. 9. *Cypripedium ventricosum*, Solton district, Altai Territory, Russia, 09.06.2019. Photo by V.S. Ruzayeva.

Authors contribution

S.V. Vazhov, G.G. Rusanov and V.M. Vazhov made the same contribution to research, material processing and manuscript preparation. A.V. Matsyura participated in the final ms version preparation.

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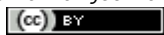
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