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Short communication

Observations of the mountain cicada population (*Cicadetta montana* Scopoli, 1772) on Mount Sandyreva ("Russian North" National Park) in 2022

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Abstract. The studies of the mountain cicada population have been conducted on M. Sandyreva and its surroundings ("Russian North" National Park) since 2019. The results of observations (2022) include the date of fixation of first exuviae of the mountain cicada larva and first imago appearance, as well as detected damage of such woody plants as an apple, a rosehip, a mountain ash, a brittle buckthorn, a honeysuckle, a juniper, and a raspberry. The plants were damaged presumably by ovipositor of the mountain cicada. The authors have collected the information on a damages size and their location on shoots, described the appearance, and specified a height of damaged plants. The data obtained was compared with the related scanty information present in the open sources.

Keywords: Vologda Oblast, plant species, egg laying, exuvium (exoskeletons)

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*Краткое сообщение***Наблюдения за популяцией цикады горной
Cicadetta montana (Scopoli, 1772)
на горе Сандыревой (Национальный парк
«Русский Север») в 2022 г.**Н.А. Губайдуллина^{1, 2}, Л.В. Кузнецова^{2*}¹ Череповецкий государственный университет, 162600, Россия, Вологодская обл., г. Череповец, пр. Луначарского, д. 5² Национальный парк «Русский Север», 161100, Россия, г. Кириллов, ул. Сиверская, д. 9А

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Аннотация. На горе Сандыревой и в ее окрестностях (национальный парк «Русский Север») с 2019 г. проводятся исследования популяции цикады горной. В результате наблюдений 2022 г. установлены даты фиксации первого экзувия личинки цикады горной и встречи первого имаго, а также обнаружены повреждения древесных растений: яблони, шиповника, рябины обыкновенной, крушины ломкой, жимолости, можжевельника и малины, нанесенные предположительно яйцекладом цикады горной. Собраны сведения по размеру повреждений и их расположению на побегах, описан внешний вид, приведены данные по высоте поврежденных растений. Полученная информация сопоставлена с немногочисленными сведениями, содержащимися в открытых источниках.

Ключевые слова: Вологодская область, виды растений, кладка яиц, экзувий

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Introduction

Mountain cicada (*Cicadetta montana* (Scopoli, 1772)) is a species of *Cicadetta* listed in the Red Books and lists of rare species of many regions of Russia, including Vologda¹, Moscow², Leningrad³, Kirov⁴, and Tver⁵. The species is also included in the Red Lists of foreign countries (Liivamägi and Tarlap, 2017).

The habitats of cicadas are associated, as a rule, with grassy communities of open landscapes. These insects react very subtly to various environmental factors, and their distribution over the area has a complex, but quite clear character (Mityaev, 1968). Unlike other singing cicadas, whose habitats are confined to arid plant formations of lowland and mountainous landscapes, the mountain cicada appear in mixed forests and reaches the taiga zone (Kudryashova, 1979). In middle latitudes, the mountain cicada is considered to be an edge species. It inhabits the edges of coniferous-deciduous forests, heated slopes and upper terraces with separate trees and shrubs (Mikhailenko, 2016), elevated meadow areas and edges on the southern slopes of hills (Belova, 2010).

Two habitats of the mountain cicada on the territory of the “Russian North” National Park have been officially confirmed: in the vicinity of Tikhonino, Lopotovo, Kovarzino (Belova, 2008; Belova and Kolesova, 2008) and Sandyrevo villages (Belova et al., 2019; Gubaidullina and Kuznetsova, 2022). On M. Sandyreva, the species was first recorded in 2019.

M. Sandyreva is a hill of glacial origin (end moraine) with the absolute height of 173.6 m and the area of 15.53 ha located in the west of the “Russian North” National Park. The hill is covered by limestone with loam and fragments of igneous rocks brought by the glacier. Absolute waterless valleys represented by catfoot-and-lichen associations⁶ dominate on the mountain. Among woody plants a common pine (*Pinus sylvestris* L., predominates), a spruce (*Picea* sp.), a mountain ash (*Sorbus aucuparia* L.), an alder buckthorn (*Rhamnus frangula* L.), a rosehip (*Rosa* sp.), a juniper (*Juniperus communis* L.), and a silver birch (*Betula pendula* Roth.) are present.

The study of the local population of the mountain cicada in this habitat has been carried out since May 2019. The work describes the results of mountain cicada observations conducted in July–August 2022.

Materials and methods

The methodology of our study developed during three previous years of investigations was based on the collection and accounting of exoskeletons, imago accounting with wooden sticks (stick diameter: about 1 cm) installed in sites of finding, and data fixing in the field diary and Excel table (version 2204, build 16.0.15128.20240). The coordinates of the finds were set with the use of the Garmin 60Cx GPS navigator and “My GPS Coordinator mobile” application (version 4.86 (232)). Photo and video recording of the finds were performed by means of the Huawei P30 Pro smartphone and Canon EOS 250D cameras.

In order to detect shoot damage caused by ovipositors of the mountain cicada, we inspected woody plants in sites where most exuviae were recorded in 2022 and earlier. We used the descriptions of ovi-

¹ Resolution of the Government of Vologda Oblast dated 25.07.2022 No. 942 “On Approval of Lists of Rare and Endangered Species (Intraspecific Taxa) of Plants, Fungi and Animals listed in the Red Book of Vologda Oblast, Lists of Species (Intraspecific Taxa) of Plants, Fungi and Animals needed in Scientific Monitoring in Vologda Oblast, and on Amendments to the resolution of the regional government dated March 29, 2004 No. 320 and invalidation of certain resolutions”.

² Decree of the Ministry of Ecology and Nature Management of Moscow Oblast dated 20.03.2018 No. 103-RM “On approval of the list of wildlife objects listed in the Red Book of Moscow Oblast”.

³ Order of the Committee for Protection, Control and Regulation of Wildlife Objects Use in Leningrad Oblast dated 11.07.2017 No. 7 “On approval of the list of wildlife objects listed in the Red Book of Leningrad Oblast”.

⁴ Resolution of the Governor of Kirov Oblast dated 07.04.2000 No. 127 “On the establishment of the Red Book of Kirov Oblast and approval of the list of rare and endangered species of animals, plants and fungi”.

⁵ Order of the Ministry of Natural Resources and Ecology of Tver Oblast dated 10.10.2012 No. 135-kv “On approval of the list of wildlife objects listed in the Red Book of Tver Oblast”.

⁶ Specially protected territory of Russia. Sandyreva mountain. Web page. URL: <http://oopt.aari.ru/oopt/Гора-Сандырева> (accessed: 15.10.2022).

positors contained in the literature, in particular, in the fundamental studies of I.V. Kudryashova (1979), I.D. Mityaev (1968), and A.I. Ilyinsky (1962).

Since text descriptions do not always give an adequate notion about an object/phenomenon, we initially got acquainted with available in free sources⁷ images of damages caused by singing cicada ovipositors. Though these images are mainly related to the periodical cicada (*Magiccicada* spp.), they give a general idea⁸ and represent a good illustrative material.

Results and discussion

The first exuviae in the amount of 9 specimens (2 ♂, 6 ♀, 1 of indeterminate sex) were found on April 20; most of them were collected on the southern slope of the hill, near the top. The first imagoes (2 individuals, sex undetermined) were recorded in the first decade of June; the same period accounted for the maximum of collected exuviae (45 ♂, 36 ♀, 3 of indeterminate sex). The period of mass molt lasted quite long, i.e. from the end of May to the second decade of June inclusive. The last collections of exoskeletons were implemented in the first week of August.

In 2022, the most massive molting season occurred at the same period as it was in the previous years. However, the finds of exuviae were recorded significantly earlier, i.e. in the second decade of April (in 2021, from May 15). The objective reasons for such an early detection of exoskeletons are not entirely clear. Perhaps they are related with the average daytime temperature about 0 °C in March 2022 versus –1.2 °C in 2021 (temperature data on Kirillov town⁹).

The mountain cicada, like other representatives of singing cicadas, lay eggs in the aboveground and better moistened parts of plants (Kudryashova, 1979) such as grass stems, petioles of leaves sprouts of shrubs and trees like linden, oak, ash, maple, elm, birch bark, bird cherry (Bey-Bienko, 1950). According to the literature data, ovipositor makes damage in the form of incisions. These are 3×10 mm cuts consisting of shallow incisions, each of which is filled with eggs arranged in two rows. In the cut, accordingly, four rows with 12–42 eggs are placed. Initially white eggs later turn into pale red. They have “elongated, fusiform shape with somewhat blunted ends, smooth and glossy with a dense shell” (Ilyinsky, 1962).

Close to the mountain cicada in terms of biology and ecology, the periodical one (*Magiccicada* spp.) often prefers angiosperms rather than gymnosperms when laying eggs. The insects-induced damage can negatively affect tree growth, weaken its branches and cause their hanging down or die off (Raupp, 2017).

The damage to the shoots of woody plants was detected for the first time at the end of June on a rosehip growing on the northern slope of the hill (Fig. 1). Visually, it was similar to the images of the identical damage caused by the singing cicada and corresponded to descriptions available in the literature. In July –August, similar injuries (cuts) were found in large numbers on the western slope of the hill and at its foot on a buckthorn, a mountain ash, a honeysuckle (*Lonicera* sp.), a raspberry (*Rubus* sp.), a juniper, and an apple tree (*Malus* sp.). The height of damaged plants was for a brittle buckthorn 0.6–0.7 m, a mountain ash – 0.2–0.7 m, a juniper – 0.5–1.2 m, a pine – 0.25 m, a rosehip – 0.2 m.

Since the period of mass reproduction of the studied species occurred at the end of May – June (according to our data) and characteristic incisions without egg signs were detected in June, we assumed that some of those cuts were referred to the previous years (Fig. 2). The damages were found on shoots of the preceding years, but some were new (Fig. 3). The damaged wood fibers were clearly visible, particularly on the old cuts (Fig. 2).

It is worth noting that one plant contained both fresh and last year's damage forming an intermittent line with a distance (from 0.3 to 9–10 cm) between two nearest cuts. A damage length varied from 0.4 to 1.8 cm.

⁷ Master gardeners of Northern Virginia. Managing cicada damage to trees. Web page. URL: <https://mgnv.org/best-management-practices/managing-cicada-damage-to-trees/> (accessed: 15.10.2022).

⁸ The materials of the article were presented at the XV regional scientific and practical conference “Local History (natural history) research in the European North” dedicated to the 30th anniversary of the creation of the “Russian North” National Park.

⁹ Gismeteo. A weather diary for schoolchildren. Web page. URL: <https://www.gismeteo.ru/diary/4277/> (accessed: 15.10.2022).



Fig. 1. Damage on the rosehip trunk.



Fig. 2. Increment damage caused to the mountain ash in 2021. The boundary of the annual growth is clearly visible – the annual ring.



Рис. 3. Increment damage caused to the mountain ash in 2022.

Conclusions

In our opinion, the study of shoots damage caused to woody plants is perspective and topical both in terms of biology of the mountain cicada living on the northern boundary of the range and for making a list of plants which female insects prefer for ovipositor.

Obviously, the method of damage investigation should be revised. In the future, it is expected to get the accurate data on branch tiers (parts of the crown) with the detected damage, including its height and depth.

Further research will allow to obtain the objective and reliable evidence of the relation between the detected damage and vital activity of the mountain cicada through a microscope-based study of shoots. Other study options may include fixation of the female mountain cicada during egg laying or leaving cuts by maggots.

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