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Ropalopus ungaricus (Coleoptera, Cerambycidae) in Šumava

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Abstract
This study brings new faunistic data and knowledge of bionomy of the longhorn beetle *Ropalopus ungaricus* (Herbst, 1784) in the Czech Republic. The text contains detailed reports on the findings of *Ropalopus ungaricus* in the Šumava mountain range and observations about bionomy, which were obtained in the field or during the breeding of the mentioned beetle in laboratory conditions. The article is based on the results of research carried out in the year 2020 in cooperation with the Šumava National Park.

Key words: Coleoptera, Cerambycidae, *Ropalopus ungaricus*, faunistics, South Bohemia, Czech Republic, Šumava (Bohemian Forest)

Introduction

Longhorn beetle *Ropalopus ungaricus* (Herbst, 1784) is a representative of a small group of longhorn beetles, which includes several interrelated and habitually similar species. At present eightteen taxa of this group are known in the area of the Western Palaearctic and they are, according to various authors, classified into species or subspecies. The used bionomic nomenclature is based on the work of Löbl & Smetana 2010. In principle, three different groups of species can be distinguished in genus *Ropalopus*: species whose development is associated with living maples and the center of their distribution is in south Europe and Middle East (*R. ungaricus*, *Ropalopus insubricus* (Germar, 1824), *Ropalopus siculus* (Stierlin, 1864) and their subspecies, *Ropalopus hanae* (Sama et Rejzek, 2002), *Ropalopus nataliyae* (Danilevsky et Skrylnik 2014), *Ropalopus lederi* (Ganglbauer, 1882), species developing in dead wood of various deciduous trees (*Ropalopus clavipes* (Fabricius, 1775), *Ropalopus femoratus* (Linnaeus, 1758), *Ropalopus macropus* (Germar, 1823), *Ropalopus sculpturatus* (Pic, 1931) and species developing in oak shoots (*Ropalopus varini* (Bedel, 1870), *Ropalopus eleonore* (Sama & Rapuzzi, 2002), *Ropalopus ledereri* (Fairmaire, 1866). In the Czech Republic there is only one species belongs to the first group – *R. ungaricus*. This species is classified as rare or very rare by various authors (Sláma 1998, Sabol 2014) and it is included in the Red List of Invertebrate Species of the Czech Republic (Kabátek & Skořepa 2017) as an endangered species. At the same time, however, this species is not protected by the valid legislation in the Czech Republic.

R. ungaricus is associated with mountain forests. Its larvae develop in sycamore maple (*Acer pseudoplatanus* Linnaeus, 1753). The habitat of the host tree affects the occurrence of this species. It can be found mainly on the edges of forest, on solitary trees, in treelines or in groves on mountain meadows. Habitat preference and bionomy of *R. ungaricus* is described in detail by HEYROVSKÝ (1955), BENSE (1995), SAMA (2002), KAŠÁK & FOIT (2018) and especially SABOL (2014) who also describes the appearance and parameters of larval galleries. Most authors (BENSE 1995, SLÁMA 1998, REJZEK & HADULLA 2000, SABOL 2014, KAŠÁK & FOIT 2018) mention sycamore maple as the primary host plant. Other host trees such as other species of maple (*Acer* sp.), willow (*Salix* sp.), ash (*Fraxinus* sp.) or beech (*Fagus* sp.) are also mentioned and often questioned (KARPINSKY et al. 2020, and others).

R. ungaricus is recently known in the Czech Republic from border mountains such as Krušné hory, Lužické hory, Jizerské hory, Kralický Sněžník, Hrubý Jeseník, Nízký Jeseník, Rychlebské hory, Moravskoslezské Beskydy, Bílé Karpaty but also Hostýnské vrchy (HONCŮ et al. 2011, KAŠÁK & GABRIŠ 2011, SABOL 2012a,b, VÁVRA & STANOVSKÝ 2013 and SABOL 2014 in general). Most of the findings are located in Moravia where intensive and targeted research also took place.

According historical records *R. ungaricus* was a more widespread species and was recorded in the Czech Republic also in other places such as Šumava, from where it is mentioned by HEYROVSKÝ (1955). *R. ungaricus* was last recorded in Šumava near Železná Ruda in 1946 by Prokeš in many pieces (SLÁMA 1998).

MATERIALS AND METHODS

The data were obtained mainly by individual collecting of imagines and also by searching for the larval galleries and exit holes of *R. ungaricus*. When searching for signs of *R. ungaricus* development, it was necessary to clearly distinguish between *R. ungaricus* and carpenter moth *Cossus cossus* (Linnaeus, 1758). Species can be distinguished on the basis of the structure of frass that is produced by the larvae and which is typical for both species. To distinguish the galleries without the presence of frass (mostly galleries several years old), the shape of galleries and form of pupal cell were examined. The pupal cell of *C. cossus* is located just below the surface of the bark or is completely missing (KŘÍSTEK & URBAN 2004). Larva of *C. cossus* develops in the sapwood where it creates deep galleries. In contrast, larva of *R. ungaricus* enters the sapwood only to create the pupal cell, development as such takes place under the bark of the living trees at the interface of the bast and the sapwood. Breeding was also used to get the knowledge of *R. ungaricus* bionomy. The breeding process of *R. ungaricus* was carried out under the following conditions: Two pairs of *R. ungaricus* were placed in plastic boxes (30×50×20 cm) together with parts of trees (branches) 30 cm long and 8 cm in diameter, which were cut from living and vital trees immediately before placing them in the containers. The wood of the following species of trees was used: sycamore maple (*Acer pseudoplatanus* Linnaeus, 1753), Norway maple (*Acer platanoides* Linnaeus, 1753), European beech (*Fagus silvatica* Linnaeus 1753) and apple tree (*Malus* sp.). Two pieces of wood of each tree species were placed in each box. The boxes were exposed to outdoor conditions until October, when they were placed in areas with a constant temperature of 20°C. In January, the boxes were moved to areas with outdoor temperature and after one month (in February) back to areas with a constant temperature. Faunistic data mentioned in the text are sorted

according to the numbers of faunistic squares (PRUNER & MÍKA 1996) and the circumstances of the findings are also given.

Results

Imagines

NP Šumava, 2 km W Nová Pec – Jelení (7149), 2♂, 2♀, on *Acer pseudoplatanus* 9. 7. 2020, lgt., det., coll. L. Skořepa; **NP Šumava, 2 km W Nová Pec – Jelení (7149)**, 2♀, on *Acer pseudoplatanus*, 14. 7. 2020, lgt., det., coll. D. Šanc, T. Peterka; **NP Šumava, 1.5 km WN Nová Pec – Jelení (7149)**, 1♂, dead imago, on *Acer pseudoplatanus*, 14. 7. 2020, lgt., det., coll. V. Dvořák; **NP Šumava, 1.5 km WN Nová Pec – Láz (7249)**, 2♀, on *Acer pseudoplatanus*, 15. 7. 2020, lgt., det., coll. L. Skořepa, D. Šanc.

Larval galleries

NP Šumava, 1.5 km WN Nová Pec – Jelení (7149), 6 recent larval galleries, on *Acer pseudoplatanus*, 4. 10. 2020, lgt., det. L. Skořepa; **NP Šumava, 2.2 km WN Nová Pec – Jelení, Václavova Mts. (7149)**, 1 recent larval galleries, on *Fagus sylvatica*, 4. 10. 2020, lgt., det. L. Skořepa; **NP Šumava, 1.7 km WN Nová Pec – Jelení (7149)**, 5 recent larval galleries, on *Acer pseudoplatanus*, 4. 10. 2020, lgt., det. L. Skořepa; **NP Šumava, 2 km WN Nová Pec – Jelení (7149)**, 2 recent larval galleries, on *Acer pseudoplatanus*, 4. 10. 2020, lgt., det. L. Skořepa; **NP Šumava, 3 km WN Nová Pec – Jelení (7149)**, 4 recent larval galleries, on *Acer pseudoplatanus*, 4. 10. 2020, lgt., det. L. Skořepa; **NP Šumava, 4.1 km WN Nová Pec – Jelení (7149)**, 6 recent larval galleries, on *Acer pseudoplatanus*, 4. 10. 2020, lgt., det. L. Skořepa; **NP Šumava, 5 km S Stožec (7148)**, 4 recent larval galleries, on *Acer pseudoplatanus*, 4. 10. 2020, lgt., det. L. Skořepa.

The results of breeding of *R. ungaricus* under laboratory conditions

After mating, both females began to lay eggs on the branches in the appropriate box. After about a month, fine frass began to appear on the surface of the branches – this indicated the beginning of feeding of the hatched larvae. In the first box we observed the beginning of the development of sixteen larvae (6 Sycamore maple, 4 Norway maple, 3 European beech, 3 apple tree). In the second box, thirteen larvae started developing (7 Sycamore maple, 3 Norway maple, 3 European beech, 0 apple tree). The following year in April and May, thirteen adults hatched. 9 specimens developed in Sycamore maple (4 and 5 – first and second box, April), two specimens in Norway maple (1 and 1, April and May), one specimen in European beech (0 and 1, May) and one specimen in apple tree (1 and 0, May). The rest of the larvae died due to the loss of wood moisture and probably also due to the non-optimal type of tree.

Discussion

In 2020, the findings of 9 imagines and 28 recent larval galleries were made on the territory of the Šumava National Park (the findings were made within three map squares). Most of the findings was located along the Schwarzenberg Canal. All the imagines were found on mature

living sycamore maples. In 2020, swarming took place on July 9, when mating and fights of males for females were observed on the trunks of the trees. Subsequently, oviposition was observed on July 14 and 15 at two localities. One dead male imago was also found at this time. On the basis of these data, it can be concluded that the imagines of *R. ungaricus* could be detected within about 10 days after their hatching. Imagines and the recent larval galleries have always been present on solitary sycamore maples or sycamore maples along forest paths and on forest edges.

A common beech (*Fagus sylvatica* Linnaeus, 1753) with one old gallery of larva of *R. ungaricus* was found in the area of the clearing on Václavova hora. Beech and maple trees grew as an admixture in the spruce stand, which was harvested. There was a clear exit hole and pupal cell, as shown by SABOL (2014), which means that the complete development of *R. ungaricus* has taken place. This fact corresponds to the our experience with *R. ungaricus* breeding in laboratory conditions, where fertilized females were offered to oviposit not only sycamore maple but also apple tree (*Malus domestica* Borkhausen, 1803), Norway maple (*Acer platanoides* Linnaeus, 1753) and common beech. The females positively preferred sycamore maple, but after a while they also oviposited to the wood of other tree species. Obviously, however, it was an exceptional situation. As many authors state (KARPIŃSKI et al. 2020, and others), development of *R. ungaricus* is also possible in other woody plants, but only exceptionally. In our opinion, females oviposit in other woody plants than sycamore maple only out of necessity. Sycamore maple is necessary to preserve the population of *R. ungaricus* while Norway maple is suitable for development in laboratory conditions. In the wood of apple tree and common beech larvae of *R. ungaricus* did not thrive and development was delayed. Some of the larvae died and only a small part of them went through a complete development. Therefore, under natural conditions, it would be appropriate to mention only sycamore maple as a host plant of *R. ungaricus*. The question of why *R. ungaricus* does not develop in other species of maple in natural conditions remains open. Norway maples are very often present in mountainous areas, but no larval galleries of *R. ungaricus* were found in the monitored area. This phenomenon could also be explained as an ecological barrier among other species of the genus *Ropalopus* which develop in other species of maples such as *R. insubricus* and *R. siculus* (observ. Skořepa in Croatia, France, Greece). The context of this information explains why for *R. ungaricus* the sycamore maple is always primarily listed as a host tree, with the addition that it can develop in other species of maples and in a range of trees without giving further details.

Conclusion

According to the data obtained so far, we can evaluate the population of *R. ungaricus* occurred in the southeastern part of the Šumava National Park as vital and promising. Sycamore maple is present in optimal conditions for its development as a part of forest stands, as well as solitaires or treelines. The disintegration of spruce stands contributed to expansion of *R. ungaricus*. Although *R. ungaricus* is included among the physiological pests of sycamore maple, which is able to directly or indirectly kill the host tree, it is necessary to look at it as an indicator of the natural habitat (natural and near-natural mountain forests) and the jewel of our entomofauna.

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