Interesting findings of beetles (Coleoptera) from Cerová vrchovina Upland in Slovakia

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Abstract: Entomological research was launched in 2019 and 2020 in Cerová vrchovina Upland. The occurrence of *Variimorda* (*Galeimorda*) *hladili* Horák, 1985 (Mordellidae) in Slovakia is confirmed. The data for three very rare beetle species are presented: *Zonitis flava* Fabricius, 1775 (Meloidae), *Odontosphindus grandis* (Hampe, 1861) (Sphindidae), *Cassida aurora* Weise, 1907 (Chrysomelidae).

Key Words: pasturelands, Insecta, Mordellidae, Meloidae, Sphindidae, Chrysomelidae

INTRODUCTION

At the beginning of the 20th century, rural areas in central Europe were frequently under immense environmental pressure due to human activities. Mistreatment of water resources, in conjunction with the arrival of large-scale agriculture, contributed to the most devastating ones (Azadi et al. 2020). Today, some people are trying to help to the country to recover from its damages, but often, establishments are still looking to benefit when it comes to natural resources.

Despite the various negative changes to land use, such as the abandonment of traditional farming (e.g. cattle grazing and skiving) and replacement of it with modern commercial technologies, insensible forest management regulations (e.g. irrational exploitations of primary forests), mining operations, droughts, and global warming, Cerová vrchovina Upland still offers treasures for entomological researchers (Szirácsik 2010, Dulák and Kovalčík 2010).

Cerová vrchovina Upland is situated in the south of central Slovakia, in the imaginary borders of the Alpine and Pannonian bioregions. In the second half of the 20th century, the most valuable biotopes and geotopes were recognised and declared small protected units, and later in 1989, the Protected Landscape Area, Cerová vrchovina, was established. As a matter of fact, diverse geomorphological relief with major altitudinal inclines enriches the diversity of species with a wide variety of habitats. The shallow soils that are characterised by heliothermic Pannonian flora, on the southern slopes of volcanic hills, strike a sharp contrast with the wet beech forests on the northern slopes. The vast lowlands with their creeks, rivers, and dams, between these highlands, further enhance the biological diversity in this dry Mediterranean-like region (Csiky et al. 2010).

It is clear now that there is a worldwide decline in insect species. As they are the primary consumers of biomass, they react to the environmental alteration immediately. Moreover, countless insect species have complex and delicate ecological requirements; therefore, they respond to these changes sensitively (Bell et al. 2020). To capture the remaining rare insect species of the erstwhile extraordinary diversity of Cerová vrchovina, we launched intensive and long-term research in 2019.

These enhanced efforts, which used several types of collecting approaches never applied before, resulted in the discovery of numerous unusual insect species. Regarding the entomological research in Slovakia, this is currently one of the most researched regions in the country. In this article, we report the most erratic insect species. Some of them are rediscoveries at a national scale, whereas other findings are interesting from a biogeographical point of view.

MATERIAL AND METHODS

Sampling

We conducted a several research expeditions in Cerová vrchovina Upland every season during 2019 and 2020. The study was conducted on various types of habitats including but not limited to pasturelands, orchards, meadows and forests. The collected material was obtained by using a sweeping net. Through the research, an interception trap was used of the dimension 100 cm × 100 cm, its collecting vessel contained salt water. The research was conducted in accordance with permission OU-BB-OSZP1–2019022541–12. If the species determination could not be done right in the field, specimens were taken by the authors for further identification in the laboratory. Hereby listed species were deposited at the authors' personal collections.

Study sites

Locality 1 – **Hegy** (48°14′43.296″N, 19°51′18.396″E, 250 m a.s.l., 7785 DFS). In the north-eastern part of the municipality of Belina village, bellow the Pannonian-Balkan Turkey oak forest there is a sun-exposed hill with rich floristic elements (Figure 1). Here grows *Euonymus europaeus* L., several scrubby *Ulmus minor* Mill. and *Prunus spinosa* L., in the understorey can be found common grass species such as *Brachypodium pinnatum* (L.) P. Beauv., *Brumus erectus* Huds., *Calamagrostis epigejos* (L.) Roth, completed with plants like *Onobrychis viciifolia* Scop., *Astragalus onobrychis* L., 1753 or *Inula ensifolia* L.

Locality 2 – **Nagy Somos** (48°12′47.077″N, 20°2′53.934″E, 270 m a.s.l., 7786 DFS). An overgrowing valley of pastureland with exceptional biological value in the vicinity of Jestice village (Figure 2). Between others here grows on vast area heliophile plants like *Securigera varia* (L.) Lassen 1989, *Lychnis coronaria* (L.) Clairv., *Vicia cracca* L. or *Nonea pulla* (L.) amended with shrubs and trees such as *Junniperus communis* L., *Prunus spinosa* L., *Cerasus avium* L. or *Prunus pyraster* (L.) Burgsd.

Locality 3 – **Sátoros** (48°10′47.285″N, 19°50′54.922″E, 450 m a.s.l., 7885 DFS). Forest on shallow acidic soil, with *Fagus sylvatica* L. mixed mainly with *Quercus petrea* (Matt.) Liebl., *Carpinus betulus* L., 1753 or with *Tilia cordata* Mill (Figure 3). Tree canopy is single layered with underdeveloped shrubs like *Sambucus racemosa* L. or *Rubus idaeus* L. Understorey is comprised by xerophilic plants such as *Melica uniflora* Retz, (L.) *Maianthemum bifolium* F. W. Schmidt or *Luzula luzuloides* (Lam.) Dandy & Wilmott.

Figure 1 Photos of examined localities (1–site 1, 2–site 2, 3–site 3). Photo of locality number 2 taken by J. Pelikán, others by A. Balázs

1 **2** **3**

RESULTS AND DISCUSSION

Variimorda (*Galeimorda*) *hladili* Horák, 1985 (Mordellidae)

Material examined: 1 ♀, Hegy, Belina (locality 1), 7.7.2020, swept off from the vegetation, J. Bezděk lgt. et coll., det. Horák. Confirmed occurrence in Slovakia.

The subgenus *Galeimorda* Horák, 1985 contains following 5 species: *Galeimorda caprai* (Franciscolo 1951), *G. fagniezi* (Méquignon 1946,) *G. krikkeni* (Batten 1977), *G. theryi* (Méquignon, 1946) and finally *G. hladili* Horák, 1985 (Horák 2008). *Variimorda hladili* is the most widespread of them. The species was described in Macedonia (Horák 1985). Since then, it was confirmed from the following countries: Bulgaria, Greece, Crete, Rhodes, Ukraine, Russia and Kazakhstan (Horák

2008). Horák (1989) published the series of 7 specimens from Čenkov which were, however, treated as uncertain and demanding confirmation. Due this fact *Variimorda hladili* was not listed for Slovakia in the Catalogue of Palaearctic Coleoptera (Horák 2008). The specimen collected in Cerová vrchovina confirms the occurrence in Slovakia and it also gives the relevance to the specimens from Čenkov (Figure 4).

***Zonitis flava* Fabricius, 1775 (Meloidae)**

Material examined: 1 ♂, Nagy Somos, Jestice (locality 2), 5.6.2019, swept off from the vegetation, J. Bezděk lgt., det. et coll. Second record for Slovakia.

The genus *Zonitis* Fabricius, 1775 contains 29 species. *Zonitis flava* is distributed in Azerbaijan, Albania, Algeria, Armenia, Austria, Bulgaria, Croatia, Czech Republic, France, Georgia, Greece, Hungary, Italy, Kazakhstan, Portugal, Romania, Slovakia, Spain, Russia, Switzerland, Ukraine, Serbia, Montenegro, Libya, Morocco, Tunisia, Cyprus, Iran, Israel, Jordan, Lebanon, Syria, Turkmenistan, Turkey, Uzbekistan and Xinjiang (Bologna 2008) (Figure 5). First record from Slovakia was published by Tomčík (2019) from Kamenica nad Hronom, Burda.

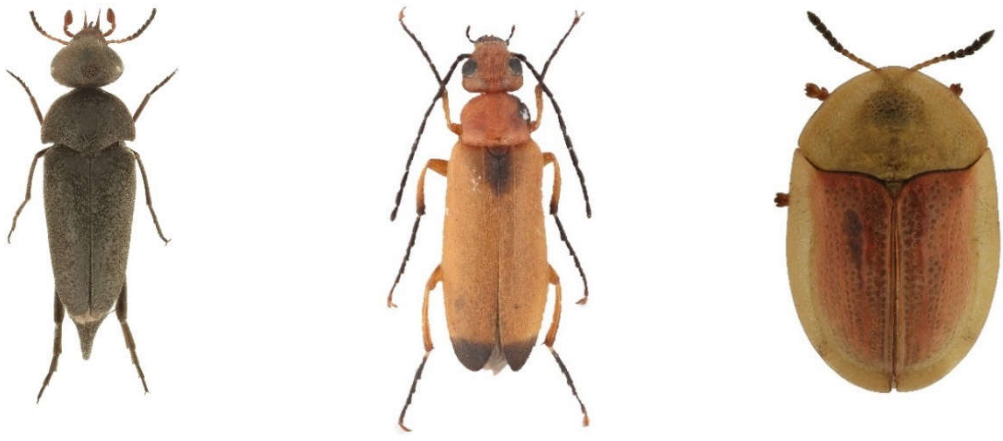
***Odontosphindus grandis* (Hampe, 1861) (Sphindidae)**

Material examined: 2 spec., Sátoros, Šiatorská Bukovinka, (locality 3), interception trap, exposed from 22.6. until 14.8.2020, Kopecký lgt., det. et coll. Second record for Slovakia.

Four species of the family *Sphindidae* live in Europe, namely: *Aspidiphorus lareyiniei* Jacquelin Du Val, 1859, *Aspidiphorus orbiculatus* (Gyllenhal, 1808), *Sphindus dubius* (Gyllenhal, 1808) and *Odontosphindus grandis* (Hampe, 1861) (Jelínek 2007a). All species of the family develop in the *Mycetozoa*, the development is documented in genera: *Lycogala* sp. (Audisio et al. 2008), *Stemonitis* sp. and *Fuligo septica* (Freeman et al. 2003). Genus *Odontosphindus* Le Conte, 1878 contains three species. Two live in North America (Audisio et al. 2008) and one species *O. grandis* (Hampe, 1861) occurs in Europe (Jelínek 2007a). *O. grandis* is documented from France (Pyrenees and Corsica) (Freeman et al. 2003), Slovakia, Croatia, Bosnia and Herzegovina, Romania, Greece (Jelínek 2007a), Italia (Audisio et al. 2008) and possible occurrence from Hungary, Bulgaria, Serbia, Montenegro, Macedonia and Ukraine presented (Jelínek 2007b). From Slovakia *O. grandis* was recorded for the first time by Jelínek (1976) from Remetské Hámre in Vihorlat Mts.

Figure 4 Photos of examined material (4 – Variimorda hladili, 5 – Zonitis flava, 6 – Cassida aurora)

4 **5** **6**



***Cassida aurora* Weise, 1907 (Chrysomelidae)**

Material examined: 1 spec., Sátoros, Šiatorská Bukovinka, (locality 3), 18.6.2020, sitting on *Rosa* sp. leaf, J. Bezděk, lgt., det. et coll. In Slovakia presently known only from Cerová vrchovina Upland.

The rarest European tortoise beetle confirmed from: Austria, Bulgaria, Croatia, Czech Republic, Greece, Hungary, Italy, Romania, Slovakia, Slovenia, Russia and Ukraine (Figure 6). The species was also confirmed in Poland (Niedojad 2013). The host plants are species of the genera *Achillea* sp.

After the Second World War, *Cassida aurora* was reliably reported from Slovakia only from Cerová vrchovina Upland (Kopecký et al. 2015, present record). The record from Bučany (Majzlan 2012) is doubtful and very probably based on misidentified specimens (Bezděk in press).

CONCLUSION

The Cerová vrchovina Upland is not an unknown area for coleopterists as it was investigated continuously mainly from the 90s of 20th century (e.g. Franc 1995, 1997, Kopecký et al. 2015, Ouda et al. 2013). The Slovakian checklist of beetles counts as much as 6711 species (Majzlan 2019). Therefore, it is still a lot to discover since our database of beetles of Cerová vrchovina Upland is comprised till this time of 1778 species. As the ongoing systematic research has just started, in the future we expect much more unusual findings of beetles. Our international research group of entomologists are building a comprehensive database of insects, consequently, a monograph of the insects of Cerová vrchovina Upland is expected to be published in the future.

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