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REMARKABLE RECORDS OF SCARABAEOIDEA (COLEOPTERA) NEAR THE TOWN OF BANSKÁ BYSTRICA (SLOVAKIA)

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V. Franc, S. Kvasnová: Pozoruhodné nálezy skarabeusovitých chrobákov (Coleoptera) pri Banskej Bystrici (Slovensko)

Abstrakt: Autori v príspevku upozorňujú na nálezy niekoľkých teplomilných skarabeusovitých chrobákov na severnom okraji Banskej Bystrice, z čoho zvlášť zaujímavý je masový nález dvoch obyčajne len ojedinele zbieraných druhov *Aphodius scrutator* a *Copris lunaris*. Ústup druhov z tejto nadčeleďade je zreteľný v celej strednej Európe, čo vidíme v citovaných, ale i ďalších tzv. červených zoznamoch. Príčinou je najmä ústup od tradičných metód obhospodarovania pôdy, zvlášť redukcia pasenia v prímestskej, ale i vidieckej krajine.

Kľúčové slová: Scarabaeoidea, Coleoptera, Banská Bystrica, koprofilny, redukcia pasenia

INTRODUCTION

Coprophilous insects are not often studied due to odorous substrate, nevertheless the results may be often interesting. In 2016 we occasionally dealt with sampling of scarabaeid beetles on the xerothermic pasture situated north of the town of Banská Bystrica. We proved several infrequent and / or declining thermophilous species. We would like to present these results in this article.

MATERIAL AND METHODS

Beetles were sampled in two sites: 1. 'Pod Baranovom' hill [48° 46' 18.44" N, 19° 8' 28.62" E; 504 m a. s. l. (later only „m“)] and 2. 'Bučičia' hill (48° 46' 28.88" N, 19° 9' 45.45" E; 612 m). The type of habitat: xerothermic or semi-ruderal limestone pasture with shrubs and solitary trees. We have used gentle methods of sampling – we collected a little number of individuals only, the rest we counted and kept alive on the site. The beetles were identified according the key by TESAŘ (1957).

Later (tab. 1) will be cited and compared ecosozological status of separate species according to the Red List of Slovakia (HOLECOVÁ, FRANC, 2001), Austria (JÄCH, 1994), Slovenia (DROVENIK, 2001), Czech Republic [FARKAČ, KRÁL, ŠKORPÍK (eds.), 2005], Germany (GEISER et al., 1998) and Poland (PAWŁOWSKI, KUBISZ, MAZUR, 2002).

RESULTS

Ecological circumstances of documented records will be commented later. The further old and undated records will be not mentioned. Coordinates of the sites are added only in the case of thoroughly localised records. Additional data, if possible, are listed in chronological order.

Geotrupes stercorarius (Linnaeus, 1758)

Site 2, in the bull faeces, July 22, 2016, 1 specimen. This species had been formerly much more abundant; unlike the related forest species *Trypocopris vernalis* (Linnaeus, 1758) and *Anoplotrupes stercorosus* (Scriba, 1791) it lives only in open country – pastureland.

Recent citations of this species are surprisingly sporadic: Jelenec village, the steppe meadow (48° 4' 3.66" N, 18° 13' 26.09" E; 460 m), June 1995 (MAJZLAN, 1996). Nature reserve (later only „NR“) Ostrov Kopáč (48° 4' 27.87" N, 17° 11' 19.67" E; 127 m), June 2006 (MAJZLAN, 2007). The village of Nová Dedina – Šándorky (48° 18' 2.05" N, 18° 39' 5.70" E; 256 m), xerothermic grassland and edge of open oak forest, May – June 2015, 11 specimens (MAJZLAN, 2016). Stará Bystrica – Skříželné (49° 20' 22.81" N, 18° 58' 10.63" E; 570 – 600 m), coniferous forest with meadow clearings, April – October 2011, 133 specimens! (KVASNIČÁK, ŠUMSKÁ, 2012). The last record requires special comment. Highly probably it is a misidentification with abundant, typically forest species *Anoplotrupes stercorosus*; all the more that this species in this paper is not at all mentioned. Mass occurrence of *Geotrupes stercorarius* in the Kysuce region is nearly impossible. Undated records are also known from the village of Plešivec (48° 33' 26.78" N, 20° 25' 2.87" E; 350 m), xerothermic karst slope above the railway station; the village of Kečovo (48° 30' 29.52" N, 20° 28' 56.07" E; 430 m), xerothermic pasture above the village; and the Turňa nad Bodvou village (48° 37' 35.35" N, 20° 53' 38.05" E; 270 m), xerothermic karst slope above the village (MAJZLAN, RYCHLÍK, 1993).

Aphodius scrutator (Herbst, 1789)

Site 2, in the cow faeces, July 22, 2016 and August 26, 2016, more than 80 specimens were observed! This species was formerly considered to be a rare species, usually found in a little number of individuals.

One of the oldest records from Slovakia is cited from close site near the village of Senica (DFS 7281a/c), August 4, 1920, 2 specimens J. Roubal lgt., coll. Slovak national museum, Bratislava (TÝR, 1999). On the other finding, we waited almost 60 years: Baranovo hill, the pasture above the burnt out motel (48° 46' 56.93" N, 19° 7' 15.97" E; 491 m), May 12, 1979, 1 specimen V. Franc lgt. (FRANC et al., 2009). The further records are cited only sporadically: NR Devínska Kobyla (7867b), undated (MAJZLAN et al., 2005); surroundings of the village Gajary (DFS 7567, approx. 140 m – exact location undetectable), May 2011 – 2014 P. Kurina lgt. 2 specimens (MAJZLAN, 2014). Turová village (48° 36' 2.44" N, 19° 2' 54.09" E; 356 m), private pasture garden of P. Potocký, in sheep faeces, first half of June 2016, 1 specimen P. Potocký lgt. (unpublished). The last record is utmost notable, because it is known mainly from the bovine, less from the horse faeces (TESAŘ, 1957; ROUBAL, 1936).

TÝR (1999) listed more than 80 both old and new data from Slovakia, they are accessible in his detailed paper; he supposes that *Aphodius scrutator* is expanding its area of occurrence due to the global warming.

Copris lunaris (Linnaeus, 1758)

Site 1, May 21, 2016, 1 specimen (a large male) only; Site 2, July 22, 2016, approximately 30 specimens. It always highly prefers bull faeces.

The further records are relatively sporadic, because this beetle leads a hidden way of life – it is ‘famous’ due to care for offspring in underground chambers. Old record is cited from NR Čachtický hradný vrch (48° 43′ 27.42″ N, 17° 45′ 34.21″ E; 298 m), steppe grassland on rocky slope, June 17, 1955 L. Korbel lgt., paradoxly noted by abbreviation Ex = extinct (MAJZLAN et al., 2000). The newer records: Gemerské Dechtáre village (48° 14′ 41.47″ N, 20° 0′ 49.50″ E; 284 m) xerothermic eolian pasture, in bull faeces June 1994, 1 specimen (FRANC, 1995). The Horné Vestenice village (48° 43′ 13.88″ N, 18° 25′ 18.50″ E, approx. 400 m), xerothermic shrubby pasture, in bull faeces, June 6, 1993 (FRANC, 2004). The village of Drňa (48° 16′ 10.30″ N, 20° 9′ 56.88″ E; 220 m), the similar circumstances, July 1995 (FRANC, 1995). The Domica cave surrounding (48° 28′ 49.43″ N, 20° 28′ 6.26″ E, 410 m), karst xerothermic grassland, 2003 – 2004, undated (MAJZLAN, 2005). The village of Žitná – Karolintal (48° 46′ 10″ N, 18° 22′ 15″ E; 290 m), undated (MAJZLAN, 2009). The village of Závada (48° 49′ 54″ N, 18° 21′ 25.24″ E; 443 m), meadow on the forest edge, May 8, 2008, J. Ryšánek, K. Sýkora R. et J. Profant lgt. (ČATLOŠ et al., 2009). Strong population was observed near the village of Kečovo (48° 30′ 29.52″ N, 20° 28′ 56.07″ E; 430 m), xerothermic pasture above the village; Silická Brezová village (48° 32′ 28.91″ N, 20° 29′ 52.36″ E; 430 m), xerothermic pasture above the village; and Soroška saddle (48° 37′ 2.06″ N, 20° 37′ 55.07″ E; 550 m), xerothermic pasture, undated records from 1979, 1985 or 1988 (MAJZLAN, RYCHLÍK, 1993).

Note: Large species of Scarabaeoidea (including *Geotrupes stercorarius* and *Copris lunaris*) prefer semi-natural anthropogenous habitats – xerothermic meadows and pastures. *Copris lunaris* and several other scarabaeid beetles are also considered to be „drastically declining“ by KONVIČKA et al. (2005).

Euoniticellus fulvus (Goeze, 1777)

Site 2, July 22, 2016, 1 specimen. A thermophilous species that has not been observed in the studied region for more than 60 years – only one old undated record „Banská Bystrica“ (TESAŘ, 1957) is available.

Formerly it had been much more abundant – recent records are very sporadic: The Plášťovce village (48° 10′ 19.32″ N, 19° 0′ 19.98″ E, 331 m), xerothermic rocky grassland with solitary trees, in sheep faeces June 23, 1983, 1 specimen (FRANC, 1998). The Horné Vestenice village (48° 43′ 13.88″ N, 18° 25′ 18.50″ E, approx. 400 m), xerothermic shrubby pasture, in bull faeces, July 1, 1995 (FRANC, 2004). NR Pohanský hrad (48° 11′ 27.80″ N, 19° 55′ 43.79″ E; 366 m), xerothermic shrubby pasture, in sheep faeces, September 1994, 1 specimen (FRANC, 1995). NR Čenkovská step (47° 46′ 9.64″ N, 18° 31′ 12.37″ E; 108 m), Malaise trap, June 1998, 2 specimens (MAJZLAN et al., 1999). The Dolné Vestenice townlet – Záviničie (48° 42′ 1″ N, 18° 23′ 17″ E; 230 m), undated (MAJZLAN, 2009). Surroundings of the village Gajary (DFS 7567, approx. 140 m – exact location undetectable), June 2011 – 2014 P. Kurina

lgt. 1 specimen (MAJZLAN, 2014). Undated record is also known from the village of Kečovo (48° 30' 29.52" N, 20° 28' 56.07" E; 430 m), xerothermic pasture above the village (MAJZLAN, RYCHLÍK, 1993).

Onthophagus taurus (Schreber, 1759)

Site 1, May 21, 2016, 1 specimen in sheep faeces. A rare thermophilous species, nevertheless its abundance is slightly increasing nowadays.

Accessible recent records: The Plášťovce village (48° 10' 19.32" N, 19° 0' 19.98" E, 331 m), xerothermic rocky grassland with solitary trees, in sheep faeces June 3, 1985, 3 specimens (FRANC, 1998). NR Pohanský hrad (48° 11' 27.80" N, 19° 55' 43.79" E; 366 m), xerothermic shrubby pasture, in sheep faeces, August 1994, 2 specimens (FRANC, 1995). The village of Drňa (48° 16' 10.30" N, 20° 9' 56.88" E; 220 m), xerothermic eolian pasture, in sheep faeces, September 1995, 1 specimen (FRANC, 1995). NR Bábský les (48° 18' 23.98" N, 17° 53' 5.27" E; 208 m), undated (CUNEV, ŠIŠKA, 2010). Xerothermic pastures in the surroundings of the village of Uhrovské Podhradie (48° 46' 0.41" N, 18° 23' 9.92" E; 345 m), May 8, 2008, J. Profant lgt. (ČATLOŠ et al., 2009). NR Čenkovská step (47° 46' 9.64" N, 18° 31' 12.37" E; 108 m), Malaise trap, June and August 1998, 2 specimens (MAJZLAN et al., 1999). Surroundings of the village Gajary (DFS 7567, approx. 140 m – exact location undetectable), May 2011 – 2014 P. Kurina lgt. 4 specimens (MAJZLAN, 2014). Malé Kršteňany village (48° 38' 49.29" N, 18° 26' 45.00" E; 365 m), abandoned xerothermic pasture, in sheep faeces June 6, 2015, 1 specimen V. Franc et M. Fašanga (unpublished). lgt. Turová village (48° 36' 2.44" N, 19° 2' 54.09" E; 356 m), private pasture garden of P. Potocký, in sheep faeces, first half of June 2016, 1 specimen P. Potocký lgt. (unpublished). Undated record is also known from the village of Kečovo (48° 30' 29.52" N, 20° 28' 56.07" E; 430 m), xerothermic pasture above the village (MAJZLAN, RYCHLÍK, 1993).

Sisyphus schafferi (Linnaeus, 1758)

Site 1, in the sheep faeces, May 21, 2016, 2 specimens. A well-known species due to its conspicuous appearance.

A relatively big amount of records is available, for example: The village of Pohranice (7675c, 48° 20' 55.49" N, 18° 11' 21.42" E; 314 m), steppe meadow near an abandoned quarry, May 1980 – 1997 (MAJZLAN, CUNEV, 1998). The Horné Vestenice village (48° 43' 13.88" N, 18° 25' 18.50" E, approx. 400 m), xerothermic shrubby pasture, in sheep faeces, July 1, 1995 (FRANC, 2004). NR Zoborská lesostep (48° 20' 57.50" N, 18° 5' 50.26" E, 425 m), xerothermic slope after local fire, June 2001 (MAJZLAN, AMBROS, 2004). The Dolné Vestenice townlet (48° 42' 37.32" N, 18° 23' 22.49" E, 306 m), xerothermic limestone pasture, on sheep faeces, April 20, 2002 (FRANC, 2004). The village of Jelšavská Teplica – Stráň hill, DFS 7387, 48° 36' 24.57" N, 20° 16' 8.05" E; 250 – 480 m a. s. l., May 9, 2008, V. Dongres observ. (BENEDIKT, 2014). NPR Vyšehrad (48° 52' 21.63" N, 18° 41' 52.96" E; 680 m), xerothermic meadow near the scree forest, June and July 2006, 2 specimens (MAJZLAN, ONDREJKOVÁ, 2008). The village of Příbelce (48° 11' 54.12" N, 19° 14' 50.67" E, 343 m), eolian sandy grassland, on sheep faeces, May 7, 2008, V. Franc

observ. (FRANC, 2010). The village of Šivetice – Muteň hill, DFS 7487, 48° 35' 36.46" N, 20° 16' 22.74" E; 350 – 450 m a. s. l., May 9, 2008, V. Dongres observ. (BENEDIKT, 2014). It may occur in urban environment as well: the city of Bratislava – the Jewish cemetery (48° 8' 35.24" N, 17° 5' 14.84" E; 162 m), 2015, 2 specimens (MAJZLAN, 2015). This record right in the centre of the capital is remarkable, but this movable beetle flies well.

Note: Often cited and in warmer regions it is a quite abundant species. MAJZLAN (2005) found 38 specimens in the surroundings of the Domicia cave during 2003 – 2004. He is often seen on the soil surface running around with the dung marbles. His legal protection, at least in Slovakia, may be debatable.

Table 1. Scarabaeid beetles on the pasture near the town of Banská Bystrica

Family / Species	Abundance in general	Trend	Ecosozological status					
			Sk	A	SI	Cz	D	PI
Geotrupidae								
<i>Geotrupes stercorarius</i> (Linnaeus, 1758)	scattered, rare	–		VU	EN			
Scarabaeidae								
<i>Aphodius scrutator</i> (Herbst, 1789)	locally frequent	++	VU	NT			EN	LC?
<i>Copris lunaris</i> (Linnaeus, 1758)	locally scarce	–	NT	CR	RE?	CR	EN	NT
<i>Euoniticellus fulvus</i> (Goeze, 1777)	scattered, very rare	–		NT		CR	CR	VU
<i>Onthophagus taurus</i> (Schreber, 1759)	locally rare	+		VU		CR	VU	?
§ <i>Sisyphus schaefferi</i> (Linnaeus, 1758)	widespread, scarce	stable	NT	NT		EN	EN	RE?

Trend: – declining, + increasing. **Ecosozological status:** Sk Slovakia, A Austria, SI Slovenia, Cz Czech Republic, D Germany, PI Poland; Categories: RE regionally extinct, CR critically endangered, EN endangered, VU vulnerable, NT near threatened, LC least concern, § protected species.

DISCUSSION AND CONCLUSION

The occurrence of several thermophilous scarabaeid beetles north of the town of Banská Bystrica at the foot of the Starohorské vrchy Mts is remarkable. Strong population of two species, including *Aphodius scrutator* and *Copris lunaris*, is especially notable.

Coprophilous beetles (and another insects) are recently declining due to decreasing of traditional methods of farming, especially significant reduction of grazing. This concerns almost the whole Slovakia, but Central Europe as well. A similar, if not worse situation is in the neighbouring Czech Republic: Up to

17 species of coprophilous scarabaeid beetles are considered to be regionally extinct here! [FARKAČ, KRÁL, ŠKORPÍK (eds.), 2005]. The situation is not good throughout Europe. *Onthophagus taurus* is ranked among regionally extinct species in Great Britain (HYMAN, PARSONS, 1992). In Denmark 8 species of coprophilous scarabaeid beetles is considered to be regionally extinct (JØRUM et al., 1998), in Sweden it is 10 species (LJUNGBERG et al., 2010). In Finland 7 species of coprophilous scarabaeid beetles is listed among regionally extinct species (RASSI et al., 2010), including the frequent forest beetle *Trypocoprís vernalis* (Linnaeus, 1758)!

Traditional methods of farming (including grazing) are most suitable for the sustainable development of suburban and rural partially agricultural land. Grazing is a prerequisite for maintaining populations of coprophilous beetles, this does not concern strictly forest species only. Moreover, it helps to preserve steppe character of the habitats in Central Europe. Grazing restriction is unnecessary and counterproductive also in protected areas, on the other hand, it should be supported. It does not concern intensive and concentrated grazing in a small plot of course – it causes destruction of the soil, including fauna. Scattered grazing in the meadows, in sparse forests and xerothermic slopes is the most desirable from the gene-pool point of view; and it does not concern coprophilous insects only.

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REFERENCES

- BENEDIKT, S. 2014. Príspevek k poznání fauny brouků (Coleoptera) Jelšavského krasu (Slovensko). Západočeské entomologické listy (Plzeň) 5: 32-90.
- CUNEV, J., ŠIŠKA, B. 2010. Chrobáky (Coleoptera) Národnej prírodnej rezervácie Bábsky les. Rosalia (Nitra) 21: 133-158.
- ČATLOŠ, D., GALOVIČ, D., PROFANT, J., RYCHLÍK, I., RYŠÁNEK, J., SÝKORA, K. 2009. Entomologické dni 2008: Chrobáky (Coleoptera) Rokoša. Rosalia (Nitra) 20: 249-258.
- DROVENIK, B. 2001. Analiza stanja biotske raznovrstnosti za področje hroščev Slovenije, p. 166-171. In ARSO, Ekspertne študije za Pregled stanja biotske raznovrstnosti in krajinske pestrosti v Sloveniji. Ljubljana, 380 pp.
- FARKAČ, J., KRÁL, D., ŠKORPÍK, M. (Eds.) 2005. Červený seznam ohrozených druhů České republiky – Bezobratlí. Agentura ochrany přírody a krajiny ČR, Praha, 760 pp.
- FRANC, V. 1995. O chrobákoch (Coleoptera) Cerovej vrchoviny so zvláštnym zreteľom k bioindikačne významným druhom. Rimava 1995, SAŽP Rimavská Sobota a Banská Bystrica, p. 52-70.
- FRANC, V. 1998. Chrobáky (Coleoptera) oblasti Litavy so zvláštnym zreteľom k bioindikačne významným druhom. In URBAN, P., BITUŠÍK, P. (Eds.): Príroda Krupinskej planiny a jej ochrana. Zborník referátov zo seminára, Zvolen, 3. 11. 1998, p. 113-129.
- FRANC, V. 2004. Beetles (Coleoptera) of the Strážovské vrchy Mts. with special reference to bioindicatively significant species, p. 103-115. In: FRANC, V. (Ed.): Strážovské vrchy Mts – research and conservation of Nature. Proceedings of the conference, Belušké Slatiny (Slovakia), October 1 & 2, 2004, 164 pp.

- FRANC, V. 2010. Príspevok k poznaniu chrobákov (Coleoptera) orografického celku Ostrôžky. In KACZAROVÁ, I. (Ed.). Ján Šalamún Petian-Petényi, život – dielo – odkaz. Zborník príspevkov z konferencie, Lučenec, 7. – 8. október 2010. Novohradské múzeum a galéria v Lučenci, Banskobystrický samosprávny kraj, p. 87-109.
- FRANC, V., 2010. Príspevok k poznaniu chrobákov (Coleoptera) okolia Príbeliec a Čeboviec. In URBAN, P., UHRIN, M. (Eds.). Príroda Príbeliec a širšieho okolia Mikroregiónu Východný Hont. Zborník referátov z odbornej konferencie (23. – 24. 11. 2007), p. 159-170.
- FRANC, V., KOPECKÝ, T., KORENKO, S. 2009. Selected arthropod groups of the Panský diel massif (Starohorské vrchy Mts, Slovakia). Fakulta prírodných vied UMB, Banská Bystrica, 80 pp.
- GEISER, R. et al. 1998. Rote Liste der Käfer (Coleoptera), p. 168-230. In BINOT, M., BLESS, R., BOYE, P., GRUTTKER, H., PRETSCHER, P. (eds.): Rote Liste gefährdeter Tiere Deutschlands. Bundesamts für Naturschutz, Bonn, xvi + 434 pp.
- HOLECOVÁ, M., FRANC, V. 2001. Červený (ekozozologický) zoznam chrobákov (Coleoptera) Slovenska, p. 111-128. In BALÁŽ, D., MARHOLD, K., URBAN, P. (Eds.), Červený zoznam rastlín a živočíchov Slovenska. Ochrana prírody (ŠOP SR Banská Bystrica) Suppl. 20: 1-159.
- HYMAN, P. S., PARSONS, M. S. 1992. A Review of the Scarce & Threatened Coleoptera of Great Britain (Part 1). Joint Nature Conservation Committee, Peterborough, 484 pp.
- JÄCH, M. A. 1994. Rote Liste der gefährdeten Käfer Österreichs (Coleoptera), p. 107-200. In GEPP, J. (Ed.). Rote Listen gefährdeter Tiere Österreichs. Grüne Reihe des Bundesministeriums für Umwelt, Jugend und Familie, Graz, 355 pp.
- JØRUM, P., KRISTENSEN, S., MAHLER, V., MARTIN, O., HOLMEN, M., GØNGET, H. 1998. Biller, p. 97-135. In STOLTZE, M., PIHL, S. (eds.): Rødliste 1997 over planter og dyr i Danmark. Miljø- og Energiministeriet, Danmarks Miljøundersøgelser og Skov- og Naturstyrelsen. København, 219 pp.
- KONVIČKA, M., BENEŠ, J., ČÍŽEK, L. 2005. Ohrozený hmyz nelesných stanovišť: ochrana a management. Sagittaria, Olomouc, viii + 128 pp.
- KVASNIČÁK, R., ŠUMSKÁ, L. 2012. Spoločenstvo chrobákov (Coleoptera) lesného biotopu v oblasti Stará Bystrica – Skríželné na Kysuciach (SZ Slovensko). Acta Fac. Paed. Univ. Tyrnaviensis, Ser. B, 16: 21-40.
- LJUNGBERG, H., ANDRÉN, B., EHNSTRÖM, B., JANSSON, N., JONSELL, M., LINDELÖW, Å., LUNDBERG, S., MALMQVIST, A., NILSSON, S. G., PETTERSSON, R. B., RAMQVIST, T., WANNTORP, H. E., WIKARS, L. O. 2010. Skalbaggat – Beetles (Coleoptera), p. 411-451. In GÄRDENFORST, U. (Ed.): The 2010 Red List of Swedish Species. ArtDatabanken, Uppsala, 565 pp.
- MAJZLAN, O. 1996. Spoločenstvá chrobákov (Coleoptera) charakteristických biotopov na území Chránenej krajinej oblasti Ponitrie. 1. časť: Fauna zemných pascí. Rosalia (Nitra) 11: 191-208.
- MAJZLAN, O. 2005. The beetle (Coleoptera) assemblages in various biotopes in the surroundings of the Domica cave (National Park Slovenský kras) Folia oecologica 32/2: 90-102.
- MAJZLAN, O. 2007. Chrobáky (Coleoptera) PR Ostrov Kopáč pri Bratislave, p. 151-196. In MAJZLAN, O. (Ed.). Príroda Ostrova Kopáč. Fytoterapia OZ, Bratislava, 287 pp.
- MAJZLAN, O. 2008. Vybrané druhy hmyzu (Coleoptera) Prírodnej rezervácie Ľutovský Drieňovec v južnej časti Strážovských vrchov. Rosalia (Nitra) 19: 93-112.

- MAJZLAN, O. 2009. Chrobáky (Coleoptera) masívu Rokoša a okolia (Strážovské vrchy). *Rosalia* (Nitra) 20: 71-100.
- MAJZLAN, O. 2011. Cenózy chrobákov (Coleoptera) vo vinohradoch Sv. Jura pri Bratislave. *Naturae Tutela* (SMOPaJ, Liptovský Mikuláš) 15/2: 163-180.
- MAJZLAN, O. 2014. Chrobáky (Coleoptera) dvoch lokalít Závod – Šišuláky a Gajary na Záhorí. *Entomofauna carpathica Bratislava* 26/2: 12-62.
- MAJZLAN, O. 2015. Biodiverzita cintorínov na príklade chrobákov (Coleoptera). *Naturae Tutela* (SMOPaJ, Liptovský Mikuláš) 19/2: 133-150.
- MAJZLAN, O. 2016. Chrobáky (Coleoptera) lokality Šándorky pri obci Nová Dedina (Štiavnické vrchy). *Naturae Tutela* (SMOPaJ, Liptovský Mikuláš) 20 (in press)
- MAJZLAN, O., AMBROS, M. 2004. Zmeny v štruktúre koleopterocenóz (Coleoptera) na dvoch plochách po požari v Národnej prírodnej rezervácii Zoborská lesostep. *Rosalia* (Nitra) 17: 67-74.
- MAJZLAN, O., BOHÁČ, J. 2012. Faunistické príspevky zo Slovenska (Coleoptera: Staphylinidae) *Naturae Tutela* (SMOPaJ, Liptovský Mikuláš) 16/2: 179-185.
- MAJZLAN, O., CUNEV, J. 1998. Chrobáky (Coleoptera) nelesných plôch v okolí lomu Pohranice pri Nitre. *Rosalia* (Nitra) 13: 155-171.
- MAJZLAN, O., ONDREJKOVÁ, M. 2008. Chrobáky (Coleoptera) Národnej prírodnej rezervácie Vyšehrad v pohorí Žiar. *Rosalia* (Nitra) 19: 153-164.
- MAJZLAN, O., RYCHLÍK, I. 1993. Chrobáky (Coleoptera) vybraných lokalít CHKO Slovenský kras. *Ochrana prírody – Naturae Tutela* 2: 129-152.
- MAJZLAN, O., RYCHLÍK, I., DEVÁN, P. 1999. Vybrané skupiny hmyzu (Coleoptera, Hymenoptera – Sphecidae, Pompilidae et Vespidae) NPR Čenkovská step a NPR Čenkovská lesostep na južnom Slovensku. *Folia faunistica Slovaca* (Bratislava) 4: 129-150.
- MAJZLAN, O., RYCHLÍK, I., KORBEL, L. 2005. Chrobáky (Coleoptera), p. 89-114. In Majzlan, O. (Ed.). *Fauna Devínskej Kobyly*. Asociácia priemyslu a ochrany prírody, Bratislava, 183 pp.
- MAJZLAN, O., ŠTEPANOVIČOVÁ, O., FEDOR, P. J. 2000. Vybrané skupiny hmyzu (Coleoptera, Heteroptera, Blattodea, Ensifera et Caelifera) na území NPR Čachtický hradný vrch (CHKO Malé Karpaty). *Folia faunistica Slovaca* (Bratislava) 5: 135-150.
- PAWŁOWSKI, J., KUBISZ, D., MAZUR, M. 2002. Coleoptera – chrząszcze, p. 88-110. In GŁOWACIŃSKI, Z. (ed.): *Czerwona lista zwierząt ginących i zagrożonych w Polsce*. Polska Akademia nauk, Instytut ochrony przyrody, Kraków, 155 pp.
- RASSI, P., HYVÄRINEN, E., JUSLÉN, A., MANNERKOSKI, I. (eds.) 2010. *The 2010 Red List of Finnish Species*. Ministry of the Environment, Helsinki, 685 pp.
- ROUBAL, J. 1936. *Katalog Coleopter (brouků) Slovenska a Podkarpatské Rusi*, 2. Učená spol. Šafárikova v Bratislave, Státní tiskárna Praha, 434 pp.
- TESAŘ, Z. 1957. *Brouci listoroží – Lamellicornia*. Fauna ČSR. Sv. 11, Díl 2, Scarabaeidae – vrubounovití, Laparosticti. Nakladatelství ČSAV, Praha, xvi + 326 pp.
- TÝR, V. 1999. Rozšíření druhu *Aphodius (Copriformorphus) scrutator* (Coleoptera: Scarabaeidae) v Čechách, na Moravě a na Slovensku. [Distribution of *Aphodius (Copriformorphus) scrutator* (Coleoptera: Scarabaeidae) in Bohemia, Moravia and Slovakia.]. *Klapalekiana* (Praha) 35: 145-156.

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