



SHORT COMMUNICATION

Coprophagous beetles (Coleoptera) found in moose (*Alces alces* L.) feces in Kampinos National Park

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ABSTRACT

This paper provides initial data on the fauna of coprophagus species related to moose feces. The research was performed in Kampinos National Park where the moose is the largest ungulate species. In the year 2016 we analyzed the material gathered in bait traps set in three habitats: meadow, heathland and mixed coniferous forest. 33 coprophagus species were collected. It appears that moose feces constitute the food source for a high number of coprophagus species representing three families: Geotrupidae, Hydrophilidae and Scarabaeidae. They are also an attractive microhabitat not only for common and numerous species but also those considered very rare in the European scale, such as: *Limarus zenkeri*, *Planolinoides borealis*, *Nimbus contaminatus* and *Sigorus porcus*.

Keywords: coprophagus beetles, moose, *Alces alces*, Kampinos National Park, ecology, Scarabaeidae, Geotrupidae

1. INTRODUCTION

To date, nearly 110 species of coprophagous species representing 3 families: Geotrupidae, Hydrophilidae and Scarabaeidae, have been recorded from the territory of Poland. They inhabit the feces of cattle, sheep, horse, deer and other mammal species (Wassmer 1995, Dormont & al. 2007, Mroczyński & Komosiński 2014, Kamiński & al. 2015, Bunalski & al. 2016). The moose is the second largest, after the European bison (*Bison bison* L.), herbivorous mammal inhabiting European forests. The impact of its feces on the shaping of forest coprophagous fauna is very weakly researched and basically limited to only individual observations of merely a few species in Kampinos National Park (Mroczyński & Marczak 2016).

The aim of this paper is to supplement current knowledge on the inhabiting of moose feces by coprophagous beetles. It is worth mentioning that moose is the largest ungulate species in Kampinos National Park thus their feces are the main food source for coprophagous species in this area. Additionally the performed research aimed at supplementing the list of coprophagous species noted in Kampinos National Park.

The presented results were obtained thanks to the financial support of the Polish State Forests' "Forest Fund" as part of the following research project: "The role of the moose in the shaping of forest coprophagous fauna – Stage I" which was performed in the year 2016.

2. RESEARCH SITES AND METHODS

All material was gathered in the year 2016 from March till September near the village of Truskaw (UTM: DC89). Bait traps were baited with moose feces (weight of bait approx. 80 g ± 10 g). The trapping was performed simultaneously on three sites:

- Fresh pine forest *Quercus robur*-*Pinetum* with a dominating pine tree stand over 180 years old and additionally occurring oaks and birches, a well developed undergrowth consisting of hazel and bird cherry shrubs. Mossy forest floor with patches of European blueberries. Large amounts of dead tree matter on the ground. Dense canopy causing intensive shading of the forest floor.
- Heathland classified in the *Arctostaphylo-Callunetum* community initiated in result of a pine forest fire in the beginning of the nineties. Presently it is a semi-open ecosystem with patches of heather separated by semi-natural dry grasslands with grey hair-grass. The whole area is a diverse combination of open areas and those overgrown with young, loosely situated pines, birches and junipers. The traps were placed further from trees in open spaces between patches of heather.
- Large complex of meadows with wet meadows classified in the *Molinion caeruleae* community, reeds and lowland fresh meadows with the latter being the dominating plant community. An open area. The traps were placed in the wetter fragments of the meadows with a minimal distance of 250 meters from the edge of the forest. Mowing of the meadows took place within the first ten days of September.

Fresh feces were collected in the springtime of 2016 on feeding grounds frequented by moose and later frozen. Three traps were set on each site and emptied every 15 days together

with the replacing of fresh bait. Altogether 126 samples were gathered and over 10 kg of feces used. The type of trap used, with inserted bait is illustrated by Photo 1.

Species new to Kampinos National Park are marked with an asterisk [*]. Names were attributed according to Lobl & Smetana (2016).



Photo 1. Bait trap baited with moose feces.

3. RESULTS

Altogether 19 234 specimens of coprophagus beetles representing 33 species, grouped in three families: Geotrupidae, Hydrophilidae and Scarabaeidae were collected. Listed below are all the species found in traps containing moose feces; species considered as rare or new to Kampinos National Park are provided with an additional description.

Geotrupidae Latreille, 1802

- *Anoplotrupes stercorosus* (Scriba, 1791)
- **Geotrupes spiniger* (Marsham, 1802)
- **Geotrupes stercorarius* Linnaeus, 1758
- **Trypocopris vernalis* (Linnaeus, 1758)

Hydrophilidae Latreille, 1802

- *Cercyon impressus* (Sturm, 1807)
- *Cercyon lateralis* (Marsham, 1802)
- *Megasternum concinnum* (Marsham, 1802)

Scarabaeidae Latreille, 1802

- *Acrossus depressus* (Kugelann, 1792)
- *Acrossus rufipes* (Linnaeus, 1758)
- *Agoliinus nemoralis* (Erichson, 1848)
- *Agrilinus ater* (DeGeer, 1774)
- *Aphodius fimetarius* (Linnaeus, 1758)
- *Bodilopsis rufa* (Moll, 1782)
- *Bodilopsis sordida* (Fabricius, 1775)
- *Chilothorax distinctus* (Müller, 1776)
- *Esymus pusillus* (Herbst, 1789)
- *Euorodalus coenosus* (Panzer, 1798)
- *Eupleurus subterraneus* (Linnaeus, 1758)
- **Limarus zenkeri* (Germar, 1813)
- *Melinopterus prodromus* (Brahm, 1790)
- *Melinopterus sphacelatus* (Panzer, 1798)
- *Nimbus contaminatus* (Herbst, 1783)
- *Onthophagus coenobita* (Herbst, 1783)
- *Onthophagus fracticornis* (Preyssler, 1790)
- *Onthophagus nuchicornis* (Linnaeus, 1758)
- **Onthophagus similis* (Scriba, 1790)
- *Otophorus haemorrhoidalis* (Linnaeus, 1758)
- *Oxyomus sylvestris* (Scopoli, 1763)
- *Planolinoides borealis* (Gyllenhal, 1827)
- *Planolinus fasciatus* (Olivier, 1789)
- *Rhodaphodius foetens* (Fabricius, 1787)
- **Sigorus porcus* (Fabricius, 1792)
- *Volinus sticticus* (Panzer, 1798)

**Geotrupes spiniger* (Marsham, 1802)

This species prefers dry pastures and sandy and well insolated fallow lands. Found mainly in cattle feces (Lumaret 1990, Bunalski 2006). Only one specimen was attracted to moose feces. New to Kampinos National Park.

**Geotrupes stercorarius* (Linnaeus, 1758)

Prefers forested areas with a diverse relief. It inhabits cattle as well as horse feces (Bunalski 2006). Considered common in Poland, noted from spring till autumn. Numerously attracted to moose feces (247 individuals).

**Trypocoprpris vernalis* (Linnaeus, 1758)

Found in both open and forest ecosystems. It feeds on the excrements of various groups of animals as well as fungi, decaying plant matter and carrion (Lumaret 1990, Bunalski 2006). Common and widely distributed in Poland. Very numerously attracted to moose feces (1004 individuals).

**Limarus zenkeri* (Germar, 1813)

In Poland noted scarcely and from scattered sites. It inhabits forests growing on sandy areas dwelling in the excrements of wild animals especially deer and roe deer, sporadically also in cattle and horse feces and carrion (Jessop 1986, Lumaret 1990). Relatively numerously attracted to moose feces (178 individuals). New to Kampinos National Park.

Nimbus contaminatus (Herbst, 1783)

Very rarely noted in Poland, found on few sites. May be found in various type of dung (Lumaret 1990). Only 3 individuals were attracted to moose feces.

**Onthophagus similis* (Scriba, 1790)

It inhabits dry and insolated sites, usually found on warm pastures, grazed fallow lands, vast clearings, as well as felling sites and forest plantations (Bunalski 2006). 5 individuals were attracted to moose feces. New to Kampinos National Park.

Planolinoides borealis (Gyllenhal, 1827)

In Poland noted only from individual sites in large, old forests in the excrements of wild animals (Bunalski 2006). Very numerously attracted to moose feces (1215 individuals).

**Sigorus porcus* (Fabricius, 1792)

In its whole known range of distribution it is rarely noted with individuals found in cow, sheep and wild animal feces. It is known for its parasitic life in the food reserves gathered by species from the genus *Geotrupes* (Jessop 1986, Lumaret 1990). Only 3 individuals were attracted to moose feces.

4. SUMMARY

Moose feces are the food base for very many coprophagus species representing 3 families: Geotrupidae, Hydrophilidae and Scarabaeidae. They are also an attractive microhabitat for not only common and numerous species but first of all those considered as very rare, such as: *Limarus zenkeri*, *Planolinoides borealis*, *Nimbus contaminatus* and *Sigorus porcus*. It cannot be excluded that thanks to this organic matter some rare species can reach very high numbers, which has a positive influence on their populations and biodiversity.

In result of the performed research 6 new species of coprophagus beetles have been noted in Kampinos National Park.

References

- [1] Bunalski M. 2006. Lamellicorn beetles (Coleoptera: Scarabaeoidea) of eastern border of Poland. A faunistic and ecological study of the northern and central part. August Cieszkowski Agricultural University in Poznań, Postdoctoral thesis, 376: 1-133.
- [2] Bunalski M., Konwerski Sz., Przewoźny M., Ruta R., Wąsala R. 2016. A contribution to the knowledge of beetles distribution in Western Poland. Part 10. Scarabaeidae, Aphodiinae: *Acrossus*, *Agoliinus*, *Agriolus*, *Aphodius*. *Ent. News*, 35 (4): 197-211.
- [3] Dormont L., Rapior S., McKey D. B., Lumaret J-P. 2007. Influence of dung volatiles on the process of resource selection by coprophagous beetles. *Chemoecology* 17: 23-30.
- [4] Jessop R. 1986. Dung beetles and chafers. Coleoptera: Scarabaeoidea. *Royal Entomological Society of London*, vol. 5, part 11: 1-53.
- [5] Kamiński M. J., Byk A., Tykarski P. 2015. Seasonal and Diel Activity of Dung Beetles (Coleoptera: Scarabaeoidea) Attracted to European Bison Dung in Białowieża Primeval Forest, Poland. *Coleopt. Bull.*, 69 (1): 83-90.
- [6] Löbl I., Smetana A. 2016. Catalogue of Palaearctic Coleoptera. Vol. 3: Scarabaeoidea, Scirtoidea, Dascilloidea, Buprestoidea and Byrrhoidea. Brill, Leiden/Boston: 961 ss.
- [7] Lumaret J-P. 1990. Atlas des Coléoptères Scarabéides Laparosticti de France. *Muséum National d'Histoire Naturelle*, Paris: 1-419.
- [8] Mroczyński R., Marczak D. 2016. A contribution to knowledge of fauna of Kampinos National Park: Scarabaeidae. Part. 2: Podrodziny: Aphodiinae, Scarabaeinae. *Ent. News*, 35 (4): 212-224.
- [9] Mroczyński R., Komosiński K. 2014. Differences between beetle communities colonizing cattle and horse dung. *Eur. J. Entomol.* 111 (3): 349-355.
- [10] Wassmer T. 1995. Selection of the spatial habitat of Coprophagous beetles in the Kaiserstuhl area near Freiburg (SW-Germany). *Acta Oecologica* 16 (4): 461-478.

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