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Coprophilous histerid beetle community (Coleoptera: Histeridae) of western Poland

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ABSTRACT. Results of the first study on species composition, abundance and seasonal dynamics of histerid beetles inhabiting dung in western Poland are presented. Beetles were sampled over two years by using pitfall traps. The 14 species collected were dominated by *Margarinotus carbonarius* which made up almost 60% of all recorded specimens. Less numerous was *Saprinus aeneus* (30%). Histerid beetles were observed since April till October. Most recorded specimens were observed during spring.

KEY WORDS: Histeridae, *Margarinotus carbonarius*, coprophilous beetles, community structure, seasonal dynamics, Poland.

INTRODUCTION

Dung of herbivorous mammals are example of patchy and ephemeral microhabitats. Physico-chemical and biotic conditions in droppings change rapidly. Because of high contents of nutritional components, droppings constitute attractive habitat for many groups of arthropods, mainly insects (HANSKI 1980, HANSKI & CAMBEFORT 1991). The characteristic feature of coprophilous insect communities in temperate regions is the dominance of dung beetles (Scarabaeoidea), especially small species belonging to the genus *Aphodius*. Almost all dung beetles are coprophagous, however some species turned out to be saprophagous e.g. among the family Aphodiidae (HANSKI & CAMBEFORT 1991). Beetles from Hydrophilidae family have a complex position in the food web. Adult Hydrophilidae are copro-

phagous, whereas their larvae are predators. The mycetophagous group is represented by Cryptophagidae and Ptilidae. Beetles belonging to Carabidae, Staphylinidae and Histeridae families are predators. The Staphylinidae family consists of predacious, saprophagous and coprophagous species (HANSKI & CAMBEFORT 1991).

Histerid beetles inhabit not only animal droppings but also other ephemeral environments such as: carcass, decaying plants, bird nests, caves, mushrooms, ant and thermit nests (MAZUR 1981). Both imagines and larvae of histerid beetles are predators and feed on other insect larvae, mainly dipterans. Histeridae were the subject of studies dealing with the dipterous pest control (ACHIENO & GILIOMEE 2007, 2008) or estimation of postmortem interval (GRASSBERGER & FRANK 2004, ARNALDOS et al. 2005, MATUSZEWSKI et al. 2008). Composition structure of dung beetle communities (Scarabaeoidea) in different parts of Poland is well known (BUNALSKI 1997a, b, GÓRZ 2003, BAJERLEIN 2004, ŻUK 2005). Also some information exist on hydrophilid beetles inhabiting dung in Poland (BAJERLEIN & PRZEWOŹNY 2005). Whereas there is completely lack of information on species composition of coprophilous histerid beetles in Poland. The main purpose of this study was to determine the structure of the community, abundance and seasonal dynamics of histerid beetles inhabiting cow dung in the Wielkopolska region.

MATERIAL AND METHODS

The study was carried out on a pasture in Rokietnica area, about 20 km north-west from Poznań, from March 28 to November 26 in 2003 and from April 3 to December 18 in 2004. Beetles were gathered using 6 pitfall traps emptied with 7 day intervals (BUNALSKI 1996). Lure substrate was fresh cow's dung. Material was preserved in 75% ethyl alcohol. Collected beetles were identified under stereomicroscope according to the key of MAZUR (1981).

Coefficient of dominance (D) was calculated as the number of specimens of particular beetle species to the total number of all analyzed beetles and expressed as a percentage. The following dominance classes were distinguished (GÓRZ 2003): superdominants (> 30,0%), dominants (5,1 - 30,0%), subdominants (1,1 - 5,0%) and recedents (< 1,0%).

Abundance of histerid beetles showed in figures 1 and 2 was expressed as a mean number of specimens collected in particular sampling date per one trap. The standard error (SE) of the mean has been given. The whole material gathered is deposited in Natural History Collections, Adam Mickiewicz University.

RESULTS

The entire material collected included 1411 individuals of 14 histerid species from 5 genera: *Atholus* THOMSON, 1859, *Hister* LINNAEUS, 1758, *Margarinotus* MARSEUL, 1853,

Onthophilus LEACH, 1817 and *Saprinus* ERICHSON, 1834 (Table 1). The studied beetle community was dominated by *Margarinotus carbonarius* which constituted almost 60% of all specimens gathered. *Saprinus aeneus* made up 30 % of all caught beetles. Less numerous beetles were: *Hister unicolor*, *Atholus duodecimstriatus*, *Margarinotus ventralis* and *Margarinotus purpurascens*. Other species were accidental (< 1%) (Table 1). The abundance of histerid beetles increased and decreased during the season several times (Fig. 1). The greatest abundance were recorded in the spring periods. In 2004 beetles appeared earlier in comparision with the year 2003. First specimens were observed at the end of April in 2003 and in the middle of April in 2004. Two peaks of abundance were observed during spring in 2004. One peak occurred at the end of April and the second one at the beginning of May. In 2003 the abundance of histerd beetles was lower, however the abundance increased at the beginning of May and June (Fig. 1). During summer and at the beginning of autumn the numbers of beetles were relatively low. Last specimens were gathered in the first part of October. In 2003 numbers of *Margarinotus carbonarius* increased and decreased several times during the spring and summer (Fig. 2). In 2004 a peak of abundance was observed at the end of April. Relatively high number was also seen at the beginning of May. During May, June and the first part of July the abundance was low. The abundance of *Margarinotus carbonarius* increased again in August and first part of September (Fig. 2).

Table 1. Beetle species collected with information on their numbers and dominance coefficient (D%).

No.	Beetle species	Total	D (%)	group of dominance
1.	*Atholus bimaculatus* (LINNAEUS, 1758)	8	< 1	recedent
2.	*Atholus duodecimstriatus* (SCHRANK, 1781)	45	3.2	subdominant
3.	*Hister unicolor unicolor* LINNAEUS, 1758	64	4.5	subdominant
4.	*Margarinotus purpurascens* (HERBST, 1792)	20	1.4	subdominant
5.	*Margarinotus ventralis* (MARSEUL, 1854)	38	2.7	subdominant
6.	*Margarinotus carbonarius* (HOFFMANN, 1803)	819	58.0	superdominant
7.	*Margarinotus obscurus* (KUGELANN, 1792)	4	< 1	recedent
8.	*Margarinotus bipustulatus* (SCHRANK 1781)	1	< 1	recedent
9.	*Margarinotus* sp.	1	< 1	recedent
10.	*Onthophilus punctatus* (O.F. MÜLLER, 1776)	1	< 1	recedent
11.	*Onthophilus striatus* (FORSTER, 1771)	1	< 1	recedent
12.	*Saprinus aeneus* (FABRICIUS, 1775)	400	28.3	dominant
13.	*Saprinus planiusculus* MOTSCHULSKY, 1849	7	< 1	recedent
14.	*Saprinus semistriatus* (SCRIBA, 1790)	2	< 1	recedent
TOTAL		**1411**	**100%**	

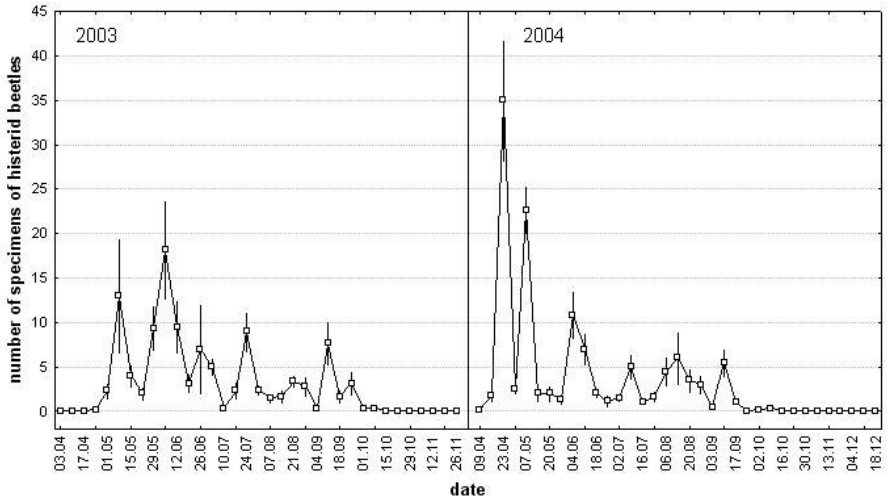

Fig. 1. Seasonal dynamics of coprophilous histerid beetles in 2003 and 2004 (mean ± SE).

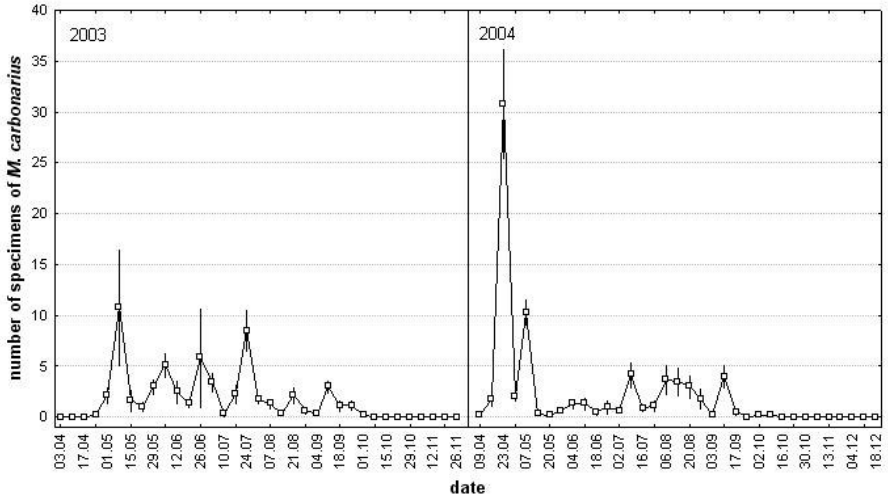

Fig. 2. Seasonal dynamics of *Margarinotus carbonarius* in 2003 and 2004 (mean ± SE).

DISCUSSION

Most papers concerning histerid beetles in Poland used to have faunistic character, presenting new records at selected sites (KONWERSKI et al. 2004, KONWERSKI & PRZEWOŹNY 2001, BYK & MAZUR 2004, RUTA et al. 2004a, b). Up to now, no attempt was made to analyze the coprophilous histerid beetle community. The presented paper gives information on species composition, abundance and seasonal dynamics of histerid beetles associated with dung in early stages of succession (1-7 day). The conducted study have shown that the community is characterized by a high dominance of only one species. Most of the recorded species were trapped by chance. There is a probability that because of frequent sampling (every 7 days), only early colonizers were gathered. According to HANSKI & KOSKELA (1977), predators tend to occur in older pats than coprophagous species. On the other hand, a similar community structure was observed in Turkey. ANLAS et al. (2007) found 12 species while collecting every two weeks. *Hister illigeri* DUFTSCHMID, 1805 constituted over 70% of all recorded specimens and other species collected were rare. A very high dominance of one species seems to be a characteristic feature of histerid beetle community. TRAUGOTT (2002) recorded four species of Histeridae in organic patato field in Austria, which were dominated by *Hister bisexstriatus* FABRICIUS, 1801 (98%). Occurrence of all collected histerid beetles in dung, except *Onthophilus striatus*, has been given earlier by MAZUR (1981). *Onthophilus punctatus* and *O. striatus* are nidicolous species, associated with mammal nests, what explain their low abundance in the collected material. The obtained results indicate that in western Poland *Margarinotus carbonarius* dominates in coprophilous histerid beetle community. According to MAZUR (1981) this species is frequently find in fresh manure and carcass. ANLAS et al. (2007) during studying coprophilous histerid beetles in Turkey also recorded *Margarinotus carbonarius*, however in the number of one specimen. TRAUGOTT (2002) gathered six specimens of *M. carbonarius* in organic patato field in Austria. The conducted study have shown that among Saprininae, *Saprinus aeneus* is a typical coprophilous species. The low numbers of *Saprinus semistriatus* and *S. planiusculus* in the gathered material support earlier observations that these two species are more frequent in carcass. KOČÁREK (2001) recorded *Saprinus semistriatus* associated with carrion of small mammals in Czech Republic and MATUSZEWSKI et al. (2008) recorded *S. semistriatus* and *S. planiusculus* while studying arthropod succesion on pig carcass in the Wielkopolska region. The obtained results on histerid beetle seasonal dynamics confirm previous observation that first individuals of histerid beetles are usually caught in early spring. TRAUGOTT (2002) found out that *Hister bisexstriatus* started to be active in the middle of April. The higher numbers of this species were recorded in the late spring and in summer and autumn the abundance was lower. After MAZUR (1981), the highest activity of *Margarinotus carbonarius* is usually observed in summer and lasts till autumn under conducive weather conditions. The analysis of the seasonal activity of this species showed that *M. carbonarius* reached its higher number in spring. Histerid beetles are good fliers what enables them migration between various habitats rich in decaying organic matter. This means that the same species often coexist in various environments. The presented results

have shown that *Margarinotus carbonarius* and *Saprinus aeneus* are typical coprophilous species in western Poland, although they also inhabit other microhabitats (MAZUR 1981). The analysis of species composition of coprophilous beetles in other parts of Poland would be important to confirm this observation. Moreover, a study on community structure of histerid beetles in other environments would be necessary to get more information on species specific to various habitats.

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