

## **Aphidophagous carabids (*Coleoptera*, *Carabidae*) in field groves and coppices**

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### **Introduction**

Absence or presence of certain ecosystems which provide refuge to animals can impoverish or enrich landscapes in some groups of animals [9]. Currently, field groves and coppices are known as an important source of useful entomofauna in agricultural environment management [4, 7]. Protecting such natural habitats of entomophages is an essential element of pest control in integrated pest management systems (IPM). The aim of the research for this reason, has been to determine the presence of aphidophagous carabids in the field groves in a diversified landscape.

### **The area and method of the research**

#### 1. The area of the research

The study was conducted in years 2000-2002 within 3 field groves situated in different parts of the Agricultural Experimental Station of the University of Warmia and Mazury in Tomaszkowo near Olsztyn.

#### 2. Description of the area

The field groves, growing on lands previously used for an agricultural production, were composed of mixed coniferous forest with dominance of pine and birch.

Site I – 0.18 ha situated about 100 m from a surfaced road and 200 m from a dirt road.

Site II – 0.06 ha situated near a former farmstead, 50 m from a dirt road.

Site III – 0.35 ha, 300 m from a dirt road.

All the three sites are surrounded by fields.

### 3. Studies on the fauna

Beetles were trapped in the groves throughout the whole vegetation period using Barber's traps. Five traps were set along a diagonal line cutting across each site. The traps contained 3% solution of formalin and some detergent which reduced the surface tension. The traps were emptied every 6-7 days. The insects were identified using Reitter's (1908), Watała's [13] and Hurk's [5] keys according to the nomenclature of Burakowski et al. [2].

## Results and discussion

A total of 1.758 specimens of carabids, considered by several authors [1, 6, 10, 12] as aphidophagous have been collected during the three years long study. Some of the authors [6, 10, 12] claimed that *Anchomenus dorsalis*, a species belonging to *Carabidae* family, is the most important in reducing populations of aphids. In addition to this, the authors assign a considerable role to some species of the genera *Pterostichus*, *Harpalus* and *Bembidion*. Among the 8 species of aphidophagous carabids, the following were dominant: *Pterostichus melanarius* (52% of the total number of the specimens trapped) and *Harpalus rufipes* (31.3%). *Calathus fuscipes* and *Anchomenus dorsalis* were caught less often. *Calathus erratus*, *Bembidion lampros* and *B. properans* or *Asaphidion flavipes* were found only sporadically (Table 1). In the research conducted in 1992 [3], also *Pterostichus melanarius* and *Harpalus rufipes* were characterised by the highest numbers. This seems to suggest that these species can play an important role in reducing number of plant pests, including aphids.

The examined three field groves differed considerably in the number of collected beetles, both from year to year and from site to site. The highest

number of beetles was caught in 2002, the smallest – in 2000. In the years 2000-2001, *Pterostichus melanarius* was the most numerous species (52.5% and 66.3% of all the species caught). In 2002, *Harpalus rufipes* prevailed (48.6% of the specimens trapped) (Table 1).

Table 1. Number of carabids trapped in the field groves in 2000-2002

No	Species	Year						Together	
		2000		2001		2002		n	%
		n	%	n	%	n	%		
1	<i>Harpalus rufipes</i> (De Geer, 1774)	110	31.1	71	11.1	370	48.6	551	31.3
2	<i>Pterostichus melanarius</i> (Illiger, 1774)	186	52.5	425	66.3	303	39.7	914	52
3	<i>Anchomenus dorsalis</i> (Pontoppidan, 1763)	22	6.2	68	10.6	27	3.5	117	6.6
4	<i>Calathus fuscipes</i> (Goeze, 1777)	32	9	68	10.6	61	8	161	9.2
5	<i>Calathus erratus</i> (Sahlberg, 1827)	-	-	2	0.3	1	0.1	3	0.2
6	<i>Bembidion lampros</i> (Herbst, 1784)	2	0.6	2	0.3	1	0.1	5	0.3
7	<i>Bembidion properans</i> (Stephens, 1828)	1	0.3	4	0.6	-	-	5	0.3
8	<i>Asaphidion flavipes</i> (Linnaeus, 1761)	1	0.3	1	0.2	-	-	2	0.1
Total		354	100	641	100	763	100	1758	100

When analysing the sites, differences in the populations of aphidophagous carabids inhabiting the groves were noticed. Most beetles were trapped in sites I and II near the dirt road or the farmstead. The smallest number of beetles was trapped in site III, most distant from the dirt road (Fig. 1).

This can imply that roadside areas consisting of grass lanes can serve as a good source of nourishment for insect predators as well as an excellent place to hide while fields are being cultivated [8]. Site III was found to contain the biggest number of species, although some of them were represented by very few specimens (Table 2). To what extent insect predators are capable of reducing populations of aphids depends not only

on the abundance of predators but also on their spatial and time distribution. In the three years of our investigations the number of beetles was observed to increase from late May, reaching its maximum from around 20<sup>th</sup> July to the end of August (Fig. 2). This means that aphidophagous carabids are present throughout the whole vegetation period. According to Sohm, Ekbom and Wikteliusa [11], aphidophagous carabids can be regarded as predators affecting the density of populations of aphids during the whole period of their occurrence. Field groves and coppices are a natural refuge for these insects travelling from crop fields.

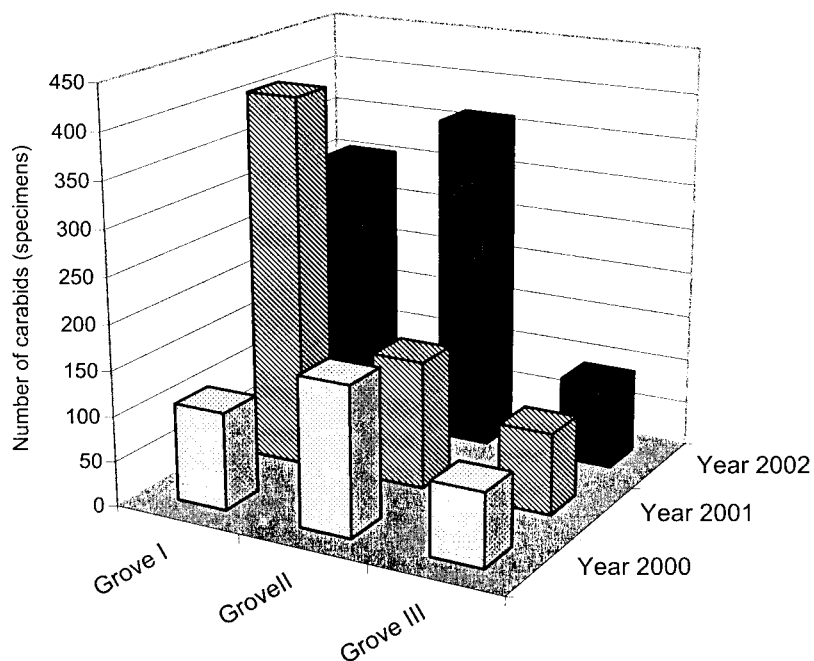


Fig. 1. Number of aphidophagous carabids in the field groves

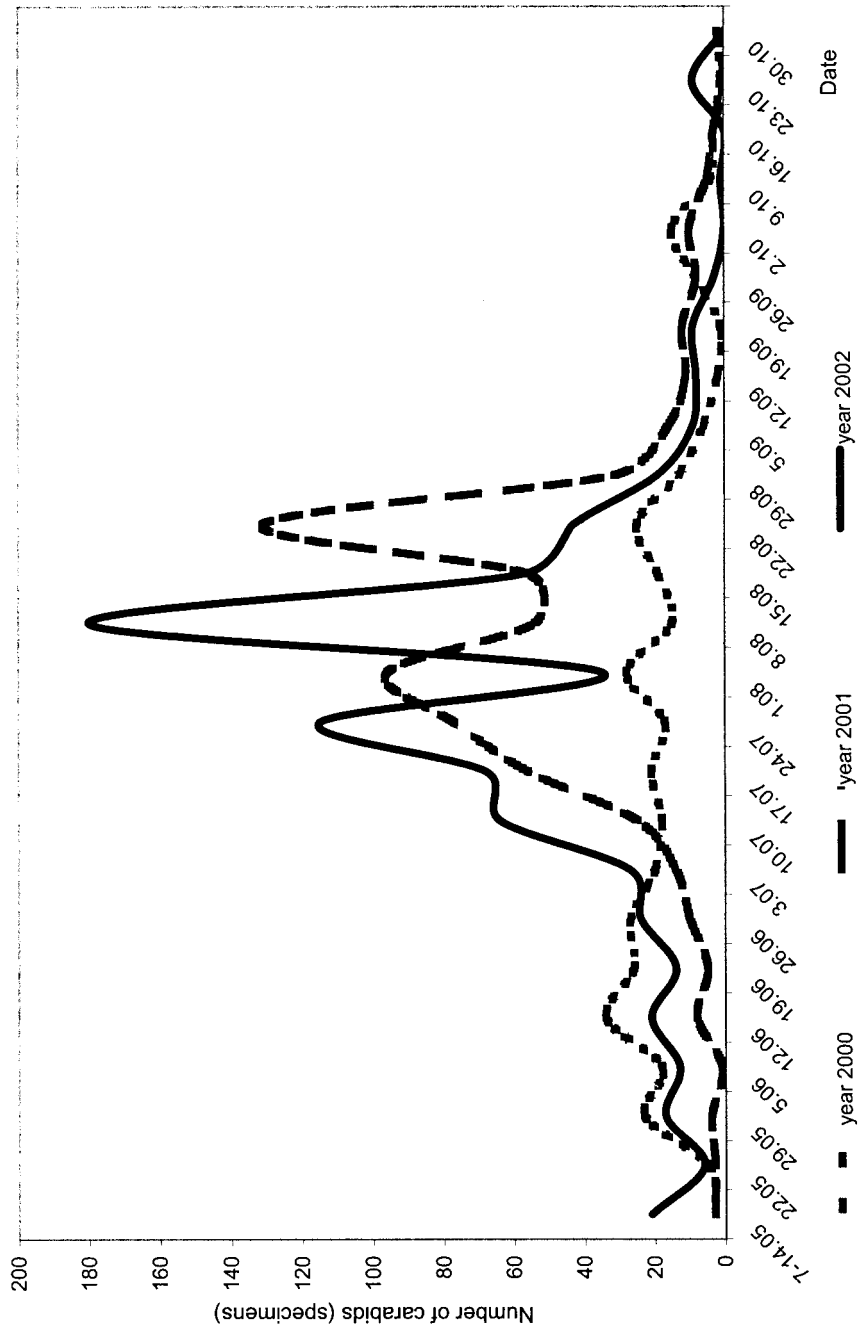


Fig. 2. Seasonal dynamics of the occurrence of carabids in the years of the study

Table 2. Number of carabids trapped in each field grove

No	Species	2000				2001				2002			
		I	II	III	Σ	I	II	III	Σ	I	II	III	Σ
1	<i>Harpalus rufipes</i> (De Geer, 1774)	36	55	19	110	17	27	27	71	76	220	74	370
2	<i>Pterostichus melanarius</i> (Illiger, 1774)	60	93	33	186	313	104	8	425	184	105	14	303
3	<i>Anchomenus dorsalis</i> (Pontoppidan, 1763)	-	3	19	22	13	6	49	68	16	8	3	27
4	<i>Calathus fuscipes</i> (Goeze, 1777)	12	14	6	32	63	4	1	68	29	31	1	61
5	<i>Calathus erratus</i> (Sahlberg, 1827)	-	-	-	-	2	-	-	2	1	-	-	1
6	<i>Bembidion lampros</i> (Herbst, 1784)	-	-	2	2	1	1	-	2	-	-	1	1
7	<i>Bembidion properans</i> (Stephens, 1828)	-	-	1	1	-	-	4	4	-	-	-	-
8	<i>Asaphidion flavipes</i> (Linnaeus, 1761)	-	-	1	1	-	-	1	1	-	-	-	-
Total		108	165	81	354	409	142	90	641	306	364	93	763

## Summary

*Pterostichus melanarius* and *Harpalus rufipes* were the most abundant species of aphidophagous carabids trapped in the field groves examined. The highest number of beetles was present in the trees and shrubs near the road and the farmstead. The highest number of aphidophagous carabids was observed from 20<sup>th</sup> July to the end of August. No chemical means of plant protection are used at this time of the year, which can imply that the number of aphidophagous carabids is primarily dependent on the source of food available in field groves and coppices.

## References

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### **Afidologiczne biegaczowate (*Coleoptera*, *Carabidae*) zadrzewień śródpolnych**

#### **Streszczenie**

Celem badań było określenie występowania afidofagicznych biegaczowatych w zadrzewieniach śródpolnych o różnym charakterze, w latach

2000-2002. Zaobserwowano różnice w liczebności badanych gatunków chrząszczy zarówno w kolejnych latach badań, jak i w poszczególnych stanowiskach badawczych. Odłowione *Carabidae*, opisywane jako mszycożerne, należały do 8 gatunków. Wśród nich dominowały *Pterostichus melanarius* i *Harpalus rufipes*. Największą liczebność afidofagicznych biegaczowatych stwierdzono w okresie od III dekady lipca do końca sierpnia.