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Cantharidae (*Coleoptera*) of pine forests in Poland

[With 3 tables and 1 figure in text]

Abstract. Presented in the paper are data on the structure of *Cantharidae* communities of pine forests from four regions of Poland. 23 species were registered in the forests studied. 22 of them were found in canopies of pines and 14 were caught in the herb layer. In the canopy layer, the dominant species were: *Cantharis obscura*, *Rhagonycha lignosa*, *Rh. elongata*, *Rh. atra*, *Malthodes pumilus*. The species most abundant in the herb layer were: *Rhagonycha lignosa*, *Malthinus punctatus*, *Silis nitidula*.

INTRODUCTION

So far, studies of *Cantharidae* communities have only been carried out in the areas of Babia Góra Mt., Świętokrzyskie (Holy Cross) Mountains and Roztocze (PAWŁOWSKI 1967; KUŚKA 1989; KUŚKA, CHOBOTOW paper in press). These studies were mostly concerned with registering *Cantharidae* species and with faunistical analyses of this family of beetles in plant associations. An attempt at making a quantitative analysis of a *Cantharidae* community was made by CHOBOTOW in his paper on the fauna of the "Bachus" linden-oak-hornbeam forest reserve in the Lublin Upland (CHOBOTOW 1989). However, the scarcity of materials did not allow a thorough analysis.

The research on the *Cantharidae* of moist pine forests was carried out in 1986 and 1987 in four regions of Poland: Puszcza Białowieska, Puszcza Biała, Bory Tucholskie and Roztocze National Park. It not only allowed for an examination of the species composition but also provided data on quantitative ratios. The studied forests of Puszcza Białowieska and Puszcza Biała were represent of the subcontinental pine forest type (*Peucedano-Pinetum*), while those of Bory Tucholskie and Roztocze NP – the suboceanic pine forest type (*Leucobryo-Pinetum*). A detailed phytosociological characteristic of the abovementioned coniferous forests is contained in MATUSZKIEWICZ's paper (MATUSZKIEWICZ et al. 1993).

In all the stands, Moericke's yellow traps were employed in order to collect specimens from canopies of pines (*Pinus silvestris* L.). Except for Roztocze where only mature forest was studied, *Cantharidae* individuals were collected in canopies of trees belonging to three forest age classes: mature forest, middle age, and young forest. Herb layer samples were drawn by means of a sweeping net. In the paper, there are no data on the herb layer samples of *Cantharidae* taken in Roztocze (1986) and Bory Tucholskie (1987).

The values of the index of abundance (n), used in this the number of study, were obtained with the following formula: $\frac{\text{individuals}}{\text{sample}} \times 1.000$. The values of the index of coefficiency, used for comparing communities of different forests studied were obtained according to Sørensen's index. The list of species includes females of the genus *Malthodes* KIES, which results from their vital importance for the quantitative proportions in a community. The available literature on the subject does not provide enough data for a trustworthy classification of such specimens into species.

RESULTS AND DISCUSSION

A total of 3463 *Cantharidae* individuals of 23 species were collected in the forests studied (Table I). The study sites in Puszcza Białowieska provided 1839 specimens of 18 species , Puszcza Biała – 716 specimens of 10 species, Bory Tucholskie – 710 specimens of 11 species. A limited-scale research in Roztocze National Park produced 198 *Cantharidae* individuals of 12 species. The indices of coefficiency of different forest communities ranged from 48 per cent – for Puszcza Biała and Roztocze communities – to 86 per cent – for Puszcza Biała and Puszcza Białowieska communities of *Cantharidae*. Only 6 species were registered in every forests studied. These were the eurytopic species of *Cantharis nigricans* and *C. pellucida*, forest polytopic species of *Rhagonycha lignosa* and *Malthinus punctatus* and oligotopic in coniferous forests species of *Cantharis obscura* and *Malthodes pumilus*. All of the species mentioned above are common and probably inhabit all regions of Poland. *Rhagonycha elongata*, *Rh. atra*, *Malthinus frontalis* and *M. biguttatus* were noted in the majority of the pine forests studied. These species are oligotopic and show a preference for pine forests. Except for the last two species, which were caught in small numbers, others should be considered characteristic elements of the coniferous forest fauna. The list of 11 exclusive species – those noted in one region only – includes both common eurytopic species and rare species that are found only occasionally in each region.

Cantharis obscura was the most abundant species (1215 specimens) in the coniferous forests. It was a dominant species in Bory Tucholskie (62.9 per cent) and Puszcza Biała (59.6 per cent) (Table II). In Puszcza Białowieska the dominance of this species was only 19.4 per cent, with the abundance figures similar to those of other forests. This was due to a greater faunistical diversification of the Puszcza Białowieska fauna. The dominance figures of *C. obscura* for Roztocze (8.5 per cent) do not probably match the actual proportion of this species in the

Roztocze communities, which, in turn, has resulted from a delay in starting the research in this area in 1986: this species belongs to those *Cantharidae* that appear very early during the year. *C. obscura* showed significant differences in abundance when communities from forests of different age classes were compared. In Puszcza Białowieska similar numbers of *C. obscura* individuals were found in pine forest stands of each age class. In Puszcza Biała it was locally very high: 115.3 specimens per sample in a young forest in Bory Tucholskie, 1986. This species can damage young tree shoots, but as the life-span of the imago is as short as three weeks, its damages to forests are not of great importance.

Table I. Species composition and number of *Cantharidae* specimens collected in canopies of pines (*Pinus silvestris*) – a the herb layer – b and in Polish moist pine forests in 1986 and 1987.

No	Species	Puszcza Białowieska		Puszcza Biała		Bory Tucholskie		Roztocze		Total
		a	b	a	b	a	b*	a**	b***	
1	*Cantharis decipiens* BAUDI							2		2
2	*Cantharis flavilabris* FALL.								1	1
3	*Cantharis livida rufipes* HERBST	34		1						35
4	*Cantharis nigricans* (O.F. MÜLL.)	268	8	45	1	3	1		1	327
5	*Cantharis obscura* L.	331	4	419		444	1	14	2	1215
6	*Cantharis pellucida* FABR.	280		50		16		1		347
7	*Cantharis rufa* L.					1				1
8	*Cantharis rustica* FALL.	11	1							12
9	*Rhagonycha atra* (L.)	34	5			1		11	1	52
10	*Rhagonycha elongata* FALL.	70	2	83		141				296
11	*Rhagonycha fulva* (SCOP.)			1	2					3
12	*Rhagonycha lignosa* (O.F.MÜLL.)	154	21	68	2	15		87	4	351
13	*Rhagonycha limbata* THOMS.	70	1							71
14	*Silis nitidula* (FABR.)	1	8						4	13
15	*Malthinus biguttatus* (L.)		1			1			2	4
16	*Malthinus facialis* THOMS.	1								1
17	*Malthinus frontalis* (MARSH.)		1			1		7		9
18	*Malthinus punctatus* (FOURCR.)	33	14	7	4	7	2	12	2	81
19	*Malthodes brevicollis* (PAYK.)	8								8
20	*Malthodes crassicornis* (Mackl.)			3						3
21	*Malthodes guttifer* KIESENW.	2								2
22	*Malthodes mysticus* KIESENW	3								3
23	*Malthodes pumilus* (BRÉB.)	33	6	17		63			3	122
24	*Malthodes* sp. (ff)	370	64	9	4	13		31	130	504
	Total	1703	136	703	13	706	4	165	33	3463
		1839		716		710		198		

* only 1986 r.
** only mature forest
*** only 1987 r.

Table II. Abundance (n') and percentage (%) of *Cantharidae* species of the canopies of pines in the studied pine forest in 1986-1987.

No	Species	Puszcza Białowieska						Puszcza Biała						Bory Tucholskie						Roztocze		Total					
		young stand		middle age		mature forest		young stand		middle age		mature forest		young stand		middle age		mature forest		mature forest		young stand		middle age		mature forest	
		%	n'	%	n'	%	n'	%	n'	%	n'	%	n'	%	n'	%	n'	%	n'	%	n'	%	n'	%	n'	%	n'
1	*Cantharis decipiens* BAUDI																			1.2	0.7					0.3	0.2
2	*Cantharis livida rufipes* HERBST	3.1	5.1	0.2	0.2	1.4	1.2	0.5	0.2													1.7	1.7	0.1	0.1	0.6	0.3
3	*Cantharis nigricans* (O.F. MÜLL.)	26.2	43.0	6.4	5.3	3.1	2.6	3.8	1.3	6.8	3.8	7.8	0.4					3.6	0.5			14.4	14.0	6.2	2.8	3.9	0.2
4	*Cantharis obscura* L.	11.0	18.1	18.4	15.0	38.3	31.5	17.9	6.0	78.7	43.4	69.9	35.8	68.6	65.6	28.3	2.2	42.9	6.4	8.5	5.2	32.1	31.2	41.1	18.7	42.1	21.1
5	*Cantharis pellucida* FABR.	25.0	41.1	9,1	7.4	5.8	4.8	7.6	2.6	4.6	2.5	9.4	4.8	0.2	0.2			17.9	2.8	0.6	0.4	14.3	13.9	6.9	3.1	7.0	3.5
6	*Cantharis rufa* L.																	1.2	0.2							0.1	0.1
7	*Cantharis rustica* FALL.	1.0	1.7	0.2	0.2	0.2	0.2															0.5	0.5	0.1	0.1	0.1	0.1
8	*Rhagonycha atra* (L.)	0.3	0.6	5.0	4.1	2.4	2.0											1.2	0.2	6.7	4.1	0.2	0.2	2.9	1.3	2.4	1.2
10	*Rhagonycha fulva* (SCOP.)									0.4	0.2													0.1	0.1		1.1
11	*Rhagonycha lignosa* (O.F. MÜLL.)	3.0	4.9	21.0	17.1	9.7	8.0	15.2	5.1	4.9	2.7	10.5	5.4	0.5	0.5	6.5	0.5	10.7	1.6	52.7	32.5	3.5	3.4	14.4	6.6	17.7	8.9

12	*Rhagonycha limbata* THOMS.	6.8	11.1	11.4	1.2	1.2	1.0															3.6	3.5	0.8	0.4	0.5	0.3
13	*Silis nitidula* (FABR.)			0.2	0.2																			0.1	0.1		
14	*Malthinus biguttatus* (L.)																	1.2	0.2							0.1	0.1
15	*Malthinus facialis* THOMS.			0.2	0.2			3.3	1.1	0.4	0.2													0.1	0.1		
16	*Malthinus frontalis* (MARSH.)															2.2	0.2			4.2	2.6			0.1	0.1	0.8	0.4
17	*Malthinus punctatus* (FOURCR.)	0.6	1.0	6.0	4.9	0.7	0.6							0.5	0.5	2.2	0.2	3.6	0.5	7.3	4.5	0.8	0.8	3.7	1.7	1.9	1.0
18	*Malthodes brevicollis* (PAYK.)			0.2	0.2	1.7	1.4																	0.1	0.1	0.8	0.4
19	*Malthodes crassicornis* (MAEKL.)							1.1	0.4			0.4	0.2									0.1	0.1			0.1	0.1
20	*Malthodes guttifer* KIESENW.			0.2	0.2	0.2	0.2																	0.1	0.1	0.1	0.1
21	*Malthodes mysticus* KIESENW.			0.7	0.6																			0.4	0.2		
22	*Malthodes pumilus* (BRÉB.)	2.7	4.5	1.4	1.2	0.7	0.6	6.5	2.2	1.5	0.8	0.4	0.2	5.9	5.6	54.3	4.2	4.8	0.7			4.3	4.2	4.8	2.2	0.9	0.4
23	*Malthodes* sp. (ff)	14.0	23.0	27.7	22.6	32.0	26.3	1.6	0.5	2.3	1.3			0.9	0.8	6.5	0.5	5.9	0.9	18.8	11.6	7,9	7.7	17.3	7.9	18.3	9.2
Total			164.2		81.6		82.3		33.7		55.1		51.2		95.6		7.8		15.0		61.6		89.4		38.2		41.3

Another *Cantharidae* species characteristic of coniferous forests (296 individuals), *Rhagonycha elongata*, was much more abundant in young pine forest stands than in older ones, both in canopies and herb layer. Almost 50 per cent of specimens were collected in Bory Tucholskie young stands where *Rh. elongata* reached an abundance of 22.4 individuals per sample.

One of the dominant species was *Rhagonycha lignosa* – a common forest polytopic species. It was abundant in all the stands with the exception of Bory Tucholskie. It occurred in the greatest numbers in Roztocze where its dominance and abundance figures were 52.7 per cent, and 32.5 individuals per sample respectively. This species showed a preference for older stands, both in the herb layer and tree canopy layer. Locally, high abundance figures were also noted for two stenothermal, eurytopic species: *Cantharis nigricans* (43.0 indiv. per sample in young stands of Puszcza Białowieska) and *C. pellucida* (43.1 indiv. per sample in the same stands).

It should also be noted that the genus *Malthodes* KIES. also had high shares in the communities of *Cantharidae* in the moist pine forest studied. 642 individuals of this genus were found, but 504 females were not ascribed to a particular species. Only *M. pumilus* females were identified as such. Male individuals of this genus were caught sporadically. Figure 1 presents a graph of abundance changes in *Cantharidae* communities, based on the (n) index. The 1986 and 1987 abundance changes in all the regions studied follow a similar pattern. Community abundance reached its peak at the beginning of June 1986 and around June 20, 1987. This peak was mostly due to high abundance of *Cantharis obscura*, *Rhagonycha elongata*, and *Rh. lignosa*. Another, smaller rise in abundance, which occurred at the end of July and the beginning of August was caused by females of the genus *Malthodes*.

There were marked differences in abundance between the year 1986 and 1987. The average abundance was 99.4 individuals per sample in 1986 and 33.5 individuals per sample in 1987. The differences observed would be much greater if the 1986 collecting had started earlier in the year, since Moericke's traps were installed after the period of the highest abundance of *Cantharidae* had begun. This concerns primarily individuals of *Cantharis obscura* that appear in the early spring. In winter *Cantharidaex* live in the litter as larvae for whom this season is a time of high activity. Low temperatures in February 1987 may have reduced the number of animals the carnivorous larvae feed upon.

On June 26, 1986 the Decis EC preparation mixed with diesel oil was sprayed from a plane over three divisions of Bory Tucholskie as an insecticide against the larvae of *Neodiprion sertifer* (FOURCR.). This spraying had no perceptible influence of the abundance of *Cantharidae*. The changes in abundance in the division where the spraying had been done were not different from those observed in the remaining forest divisions.

No regular tendencies were noted as far as changes in the structure and abundance in *Cantharidae* populations inhabiting forest stands of different age classes are concerned (Table II). The changes followed a different pattern in each region. In general, however, older coniferous forests (middle age, mature forest) had a more diversified fauna (18 species each). The species most frequently

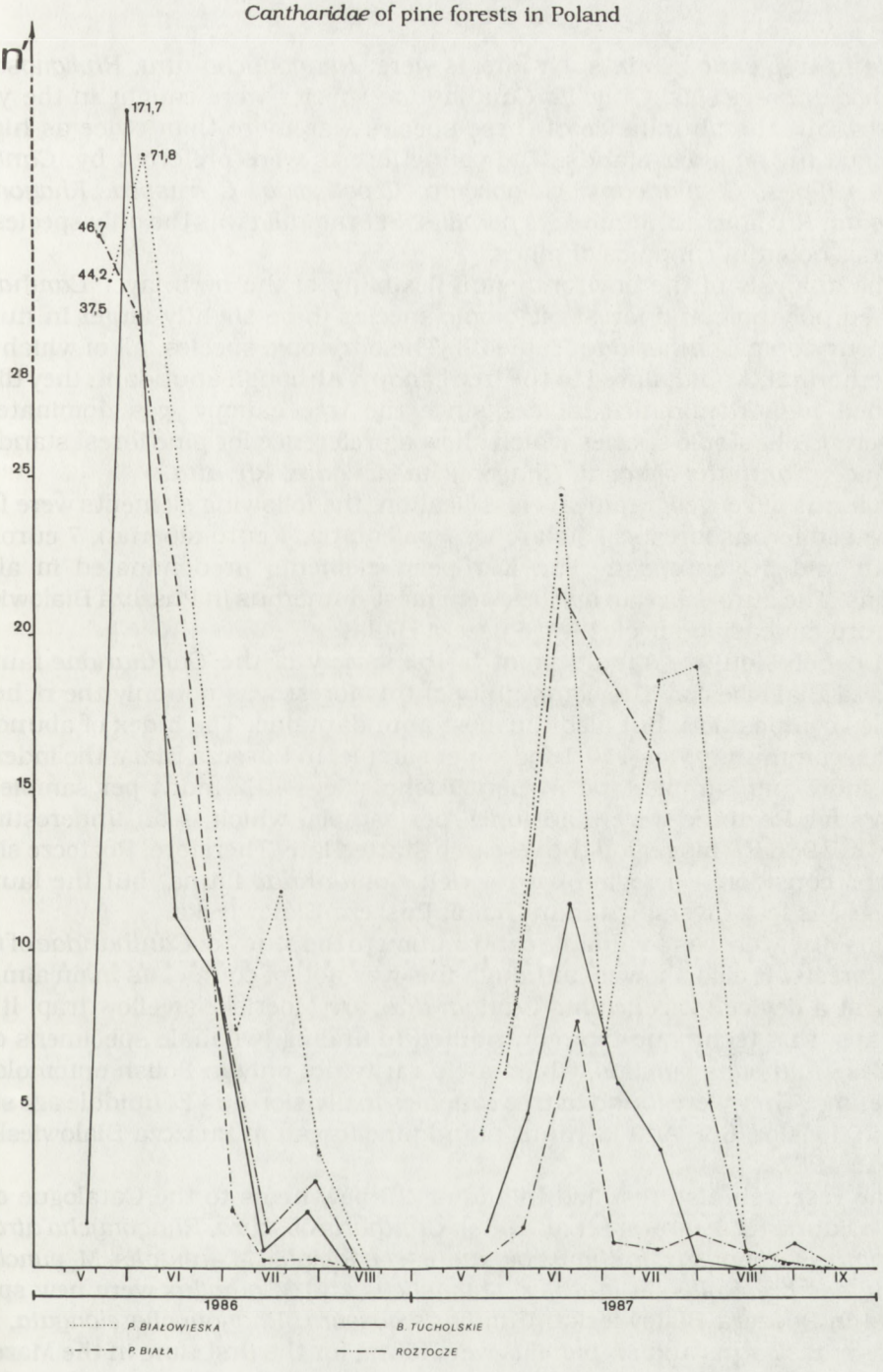

Fig. 1. Changes in the abundance (n') of *Cantharidae* in coniferous forests of four regions of Poland in 1986 and 1987.

found in tree canopies in such forests were: *Rhagonycha atra*, *Rh. lignosa* and *Malthodes brevicollis*. Only 12 *Cantharidae* species were caught in the young forests, but the abundance of these species was more than twice as high as obtained in the older stands. The young forests were preferred by: *Cantharis livida rufipes*, *C. nigricans*, *C. obscura*, *C.pellucida*, *C. rustica*, *Rhagonycha elongata*, *Rh. limbata*, *Malthodes pumilus*, *Silis nitidula* was the only species that was not noted in canopies of pines.

The analysis of the environmental flexibility of the herb layer *Cantharidae* showed polytopic and forest oligotopic species to be slightly larger in number than eurytopic *Cantharidae* (Table III). The eurytopic species, all of which were stenothermal, would moved to the tree canopy. Although abundant, they did not reached high dominance indices since the tree canopy was dominated by numerous oligotopic species which show a preference for pine forest stands, for instance: *Cantharis obscura*, *Rhagonycha elongata*, *Rh. atra*.

In terms of zoogeographical classification, the following elements were found in the coniferous forests: 1 holarctic, 1 palearctic, 4 euro-siberian, 7 euro-caucasian and 10 european. The European elements predominated in all the regions. The euro-siberian species were most numerous in Puszcza Białowieska, the euro-caucasian species – in Puszcza Biała.

In conclusion, we should point to the variety of the *Cantharidae* fauna of Puszcza Białowieska. The community of this forest was not only the richest in species composition, but also the most abundant one. The index of abundance for this community was 110.1 indiv. per sample. In Puszcza Biała, the index was 46.2 indiv. per sample, and in Bory Tucholskie – 40.2 indiv. per sample. The figures for Roztocze were 60.6 indiv. per sample, which is an underestimate, since in 1986 in this region the research started late. Therefore, Roztocze should also be considered a region with a rich *Cantharidae* fauna, but the fauna of Roztocze is less diversified than that of Puszcza Białowieska.

This research was a valuable contribution to the study of *Cantharidae* of moist pine forests. It also showed, although this was not, of course, its main aim, how efficient a device for collecting *Cantharidae*, are Moericke's yellow trap. It was, perhaps, this technique that contributed to finding two male specimens of the species *Malthodes pumilus*, which are a rarity not only in Polish entomological museums. They were found in tree canopies in division 634 Ef (middle age stand) and in division 668 Ad2 (a young stand pine forest) in Puszcza Białowieska on July 2, 1987.

The research also resulted in adding 25 new items to the Catalogue of the Polish Fauna (BURAKOWSKI et al. 1985); *Cantharis obscura*, *Rhagonycha atra*, *Rh. elongata*, *Rh. lignosa*, *Malthinus biguttatus*, *M. facialis*, *M. frontalis*, *M. punctatus*, *Malthodes brevicollis*, *M. guttifer*, *M.mysticus* and *M.pumilus* were new species found in Puszcza Białowieska; *Cantharis obscura*, *Rhagonycha elongata*, *Malthodes crassicornis* and *M. pumilus* were found for the first time in the Mazovian Lowland; *Rhagonycha atra*, *Rh. elongata*, *Malthinus biguttatus*, *M. frontalis*, *M. punctatus* and *Malthodes pumilus* were new to Pomeranian Lakeland; *Cantharis decipiens*, *Malthinus frontalis* and *Malthodes pumilus* were new species in the area of Roztocze National Park.

Table III. Classification of Polish moist pine forest *Cantharidae* species into different ecological flexibility groups.

Ecological groups	Puszcza Białowieska				Puszcza Biała				Bory Tucholskie				Roztocze	
	herb layer	conopies of pines			herb layer	conopies of pines			herb layer	conopies of pines			herb layer	conopies of pines
		young stand	middle age	mature forest		young stand	middle age	mature forest		young stand	middle age	mature forest		mature forest
Eurytopes	3	5	5	5	1	3	2	2	1	1		2	1	1
Polytopes forest areas	4	2	5	3	2	3	2	2	1	2	2	3	4	3
Olygotopes forest areas	5	4	6	5		3	2	3	1	3	3	4	3	3
Olygotopes open areas					1		2					1	1	

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STRESZCZENIE

[Tytuł: Skład gatunkowy i struktura zgrupowań *Cantharidae* (*Coleoptera*) borów świeżych.]

W latach 1986-1987 prowadzono w czterech regionach Polski porównawcze badania borów świeżych, w których stwierdzono 3463 osobniki z 23 gatunków *Cantharidae*. W koronach sosen, oprócz eurytypów, do dominujących elementów należały: *Cantharis obscura*, *Rhagonycha lignosa*, *Rh. elongata*, *Rh. atra* i *Malthodes pumilus*. W runie łowiono głównie *Rhagonycha lignisa*, *Malthinus punctatus* i *Silis nitidila*. W starszych drzewostanach (drągowina, starodrzew) odnotowano 18 gatunków. Częściej łowiono tam: *Rhagonycha atra*, *Rh. lignosa*, *Malthodes brevicollis*. W młodnikach wystąpiło 12 gatunków omomiłków. Oprócz pospolitych eurytopów w młodnikach częściej odławiano *Rhagonycha elongata* i *Malthodes pumilus*. Wśród kilku rzadkich gatunków znaleziono samce *Malthodes pumilus*.

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