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*SARCOPHAGIDAE* AND *RHINOPHORIDAE* (DIPTERA)  
OF WARSAW AND MAZOVIA

## ABSTRACT

The Mazovian Lowland is inhabited by 83 species of flies of the family *Sarcophagidae* and eight species of the family *Rhinophoridae*, which account for 65.4 and 47.1%, respectively, of the species known from Poland. In Warsaw there are 51 species of *Sarcophagidae* and six species of *Rhinophoridae*, or 61.4 and 75% respectively, of the species known from the Mazovian Lowland.

In the suburbs of Warsaw, 46 species of these flies have been recorded, and in urban green areas 43 species, including 39 in parks, 15 in green areas of housing estates, and 18 species in the centre of the town.

In the Mazovian Lowland and in Warsaw, these are mostly European species. Parasitoids of hymenopterans are represented by more species than parasitoids of earthworms.

## INTRODUCTION

Data on the occurrence of flies of the families *Sarcophagidae* and *Rhinophoridae* in the Mazovian Lowland and Warsaw have been summarized by Draber-Mońko [3,4]. These flies have not been extensively studied in Mazovia and Warsaw so far. From the Mazovian Lowland, 69 species of *Sarcophagidae* and six species of *Rhinophoridae* were known. Of this number, six species were listed by Sznabl [7] and the other by Draber-Mońko [4]. At present 91 species are known from the Mazovian Lowland, including 8 species of *Rhinophoridae*.

From Warsaw, 16 species of *Sarcophagidae* and four species of *Rhinophoridae* were known. Eight of them were noted by Sznabl [7] and the other by Draber-Mońko [3]. At present 57 species are recorded, including six species of *Rhinophoridae*.

The objective of the paper was to analyse the species composition of *Sarcophagidae* and *Rhinophoridae* occurring in the Mazovian Lowland and in Warsaw, and a zoogeographical and ecological analysis of the collected material.

The present contribution is mostly based on the materials collected in Warsaw in 1974—1978, and in the Mazovian Lowland in 1976—1978, by means of Moericke's traps suspended in tree crowns. Five- and nine-day

samples were taken continuously over the growing season. Also the non-identified materials from the collection of Sznabl were used. They had been collected in Mazovia and Warsaw almost 100 years ago.

In the Mazovian Lowland, the material was collected by Moericke's traps from the following localities: Hamernia (oak-hornbeam forest and carr), Radziejowice (a park), Wola Mrokowska, Młochów, and Kampinos forest (mixed coniferous forest and pine forest).

In Warsaw, the same method was used in the following sites. The suburbs: Ursynów (a park), allotments near Okęcie, Bielany (an oak-hornbeam forest), Jelonki and Białoleka Dworska (oak-hornbeam forest, mixed coniferous forest, and pine forest); urban parks: Łazienki, Saxon Garden, Praga, and Cemetery of Soviet Soldiers; green areas of housing estates: Wierzbno and Stawki; the centre of the town: Konstytucji Square, and the courtyard green at Koszykowa street and at the Institute of Zoology, Wilcza street.

The study area, methods and underlying premises of the study are described in detail elsewhere [1, 5, 6, 8].

#### SPECIES COMPOSITION OF *SARCOPHAGIDAE* AND *RHINOPHORIDAE* OF WARSAW AS COMPARED WITH MAZOVIA

In the Mazovian Lowland there are 83 species of flies of the family *Sarcophagidae* and eight species of the family *Rhinophoridae* (Table 3), or 65 and 47%, respectively, of these flies known from Poland. In Warsaw, 51 species of *Sarcophagidae* and six species of *Rhinophoridae* were caught. They account for 61 and 75%, respectively, of the species known from the Mazovian Lowland.

In Warsaw, the two families are represented by the highest number of 46 species in the suburbs. There were 43 species caught in urban green areas, including 39 species in urban parks. *Sarcophagidae* and *Rhinophoridae* of green areas of housing estates are poor, 15 species being recorded there, thus less than in courtyards of the centre of the town where 18 species were caught. At Konstytucji Square only single specimens of three species, *Sarcophaga lehmani*, *Bercaea haemorrhoidalis*, and *Oebalia praeclusa*, were captured.

In the Mazovian Lowland and in all types of urban green areas, nine species of *Sarcophagidae* and *Rhinophoridae* occurred in common: *Macronychia polyodon*, *Ravinia striata*, *Parasarcophaga argyrostoma*, *Bercaea haemorrhoidalis*, *Sarcophaga carnaria*, *S. lehmani*, *S. subvicina*, and *Frauenfeldia rubricosa*.

In the present paper there are 16 species recorded for the first time in the Mazovian Lowland, including two species new to the fauna of Poland. These are *Miltogramma taeniatum* and *Blaesoxipha ungulata*.

## ZOOGEOGRAPHICAL ANALYSIS

In the Mazovian Lowland and in all the types of urban green areas in Warsaw, the highest number of European species has been recorded, a lower number of Euro-Siberian, Palaearctic, and Holarctic species, and very small numbers of the species belonging to other geographical elements (Table 1).

In the suburbs of Warsaw and in all types of urban green areas, the number of species belonging to particular zoogeographical elements decreases but the proportions among them are maintained at a similar level as compared with those in Mazovia.

Submediterranean species have been eliminated from green areas of housing estates and from the centre of Warsaw. Euro-Caucasian species have not been recorded at all in urban green areas. It is interesting that the number of cosmopolitan species dropped in urban green areas, though their proportion increased as compared with that in Mazovia.

## ECOLOGICAL ANALYSIS

In the Mazovian Lowland, flies of the family *Rhinophoridae* associated with wooded habitats predominate (about 89%), while *Sarcophagidae* associated with forests account for about 14% of the flies of this family known from Mazovia.

In Mazovia, the highest number of species (about 80%) are poly- and oligotopic, eury- and stenotopic species being poorer.

In the suburbs of Warsaw and in urban green areas, similar proportions were found among groups of species with special habitat requirements. Polytopic species predominate in all types of urban green areas in Warsaw.

Adult *Sarcophagidae* and *Rhinophoridae* are melliphages. Their main food consists of nectar and pollen of more than ten plant families, as well as of honeydew produced by aphids and scale insects.

Larval *Rhinophoridae* parasitize saprophagous, terrestrial *Isopoda*. In Mazovia seven species of *Isopoda* have been recorded [2], of which two species, *Porcelio scaber* and *Oniscus asellus*, are potential hosts of *Chaetostenenia maculata* and *Frauenfeldia rubricosa*.

Larval *Sarcophagidae* can be classified into a few trophic groups such as parasites of invertebrates and vertebrates, pantophages, predators, and saprophages.

In Mazovia, the highest number of species belongs to *Sarcophagidae*, the larvae of which are parasitoids of hymenopterans, mostly *Aculeata*. Pantophages, parasitoids of snails, isopods, earthworms, and orthopterans, as well as coprophages, are also represented by a high number of species. Also in the suburbs of Warsaw, most species parasitize hymenopterans (*Aculeata*), isopods, earthworms, or they belong to pantophages and copro-

Table 1. Proportion of zoogeographical elements in *Sarcophagidae* and *Rhinophoridae* of Warsaw and non-urban habitats of Mazovia (N — number of species)

Zoogeographical element	Mazovia		Warsaw									
			Suburbs		Urban green areas							
	Total				Parks		Housing estates		Town centre			
	N	%	N	%	N	%	N	%	N	%	N	%
Cosmopolitan	3	3.3	2	4.4	2	4.7	1	2.6	1	6.7	1	5.6
Holarctic	8	8.8	5	10.9	6	14.0	6	15.4	2	13.3	2	11.1
Palaeartic	10	11.0	6	13.0	4	9.3	3	7.7	2	13.3	3	16.7
Euro-Siberian	14	15.4	9	19.6	9	20.9	9	23.1	4	26.7	2	11.1
European	50	54.9	22	47.8	21	48.8	19	48.7	6	40.0	10	56.0
Submediterranean	5	5.5	1	2.2	1	2.3	1	2.6	0	0	0	0
Euro-Caucasian	1	1.1	1	2.2	0	0	0	0	0	0	0	0

phages. Parasites of beetles have not been caught there. Similarly, urban green areas of Warsaw are mostly inhabited by the species parasitizing hymenopterans (*Aculeata*), isopods, and earthworms, and also by pantophages. Parasitoids of orthopterans, beetles, and mammals are lacking there. In urban parks, the number of species the larvae of which are parasitoids of hymenopterans (mostly *Aculeata*) and isopods is a little lower. Green areas of housing estates are predominated by the species the larvae of which are coprophages. The parasites of hymenopterans (mostly *Aculeata*) and earthworms are represented by three species each. Two species belong to pantophages. In the centre of the town there are mostly parasites of hymenopterans (*Aculeata*) and earthworms, while coprophages and parasites of isopods are represented by a smaller number of species (Table 2).

Flies of the family *Rhinophoridae* were scarcely caught in both Mazovia and Warsaw. They are most abundant in broad-leaved woods in the suburbs of Warsaw.

Most flies of the family *Sarcophagidae* are more abundant in Mazovia than in green areas of Warsaw. Flies of the genus *Sarcophaga* Meig. parasitizing earthworms are more abundant in the suburbs of Warsaw, in urban parks and in green areas of housing estates, than in Mazovia.

Also coprophages are more abundant in Warsaw than in Mazovia. For instance, *Bercaea haemorrhoidalis* reached highest abundance in green areas of housing estates.

In Warsaw, particularly in urban parks and green areas of housing estates, the species parasitizing hymenopterans of the family *Sphecidae* are abundant, e. g. *Macronychia polyodon*.

#### SPECIES NEW TO POLAND

##### *Miltogramma taeniatum* Meigen, 1824

Two specimens: Mazovian Lowland. Sochaczew-Trojanów, young pine plantation, 24 July, 1970. Warsaw-Białoleka Dworska, pine forest, a pine, 6—11 August, 1976.

Larvae of this species are likely to parasitize hymenopterans, like most representatives of this genus. So far the species recorded only from Europe.

##### *Blaesoxipha ungulata* Pandellé 1896

One specimen: Mazovian Lowland. Wola Mrokowska, a lime, 27 July—2 August, 1976.

Larvae are likely to parasitize orthopterans, like most representatives of this genus. The species so far recorded from southern Europe.

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Table 2. Proportions of trophic groups in *Sarcophagidae* and *Rhinophoridae* of Warsaw and non-urban habitats of Mazovia (N — number of species)

Trophic group	Mazovia		Warsaw									
			Suburbs		Urban green areas							
					Total		Parks		Housing estates		Town centre	
	N	%	N	%	N	%	N	%	N	%	N	%
<i>Hymenoptera</i>	36	39.6	14	30.4	13	30.2	10	25.6	3	20.0	6	33.3
<i>Orthoptera</i>	5	5.5	2	4.3	—	—	—	—	—	—	—	—
<i>Lepidoptera</i>	1	1.1	1	2.2	1	2.3	1	2.6	—	—	—	—
<i>Coleoptera</i>	1	1.1	—	—	—	—	—	—	—	—	—	—
<i>Aranei</i>	1	1.1	1	2.2	1	2.3	1	2.6	—	—	—	—
<i>Isopoda</i>	8	8.8	5	10.9	5	11.6	4	10.3	1	6.7	3	16.7
<i>Lumbricidae</i>	5	5.5	5	10.9	5	11.6	5	12.8	3	20.0	5	27.8
<i>Mollusca</i>	10	11.0	3	6.5	4	9.3	4	10.3	1	6.7	—	—
<i>Mammalia</i>	1	1.1	1	2.2	—	—	—	—	—	—	—	—
Pantophages	15	16.5	7	15.2	7	16.3	7	17.9	2	13.3	1	5.6
Saprophages	5	5.5	5	10.9	4	9.3	4	10.3	4	26.7	3	16.7
Predators	3	3.3	2	4.3	3	7.0	3	7.7	1	6.7	—	—

Table 3. Check-list of *Sarcophagidae* and *Rhinophoridae* (Diptera) species occurring in Warsaw and Mazovia

No.	Species	Mazovia	Warsaw				
			Suburban areas	Parks	Green areas in housing estates	Town centre	Other sampling areas
1	2	3	4	5	6	7	8
	<i>Sarcophagidae</i>						
1	<i>Macronychia agrestis</i> (Fall.)	—	+	—	—	—	—
2	<i>Macronychia conica</i> (R.-D.)	●	—	—	—	—	—
3	<i>Macronychia griseola</i> (Fall.)	●	+	+	+	—	—
4	<i>Macronychia polyodon</i> (Meig.)	●	+	+	+	+	—
5	<i>Macronychia striginervis</i> (Zett.)	●	●	—	—	—	—
6	<i>Amobia signata</i> (Meig.)	●	+	+	+	—	—
7	<i>Taxigramma heteroneurum</i> (Meig.)	●	—	—	—	—	—
8	<i>Senotainia albifrons</i> (Rond.)	●	—	—	—	—	—
9	<i>Senotainia conica</i> (Fall.)	●	+	+	—	—	○
10	<i>Senotainia tricuspis</i> (Meig.)	—	—	+	—	+	+
11	<i>Pterella convergens</i> (Pand.)	●	—	—	—	—	—
12	<i>Pterella grisea</i> (Meig.)	○	—	—	—	—	—
13	<i>Pterella melanura</i> (Meig.)	●	—	—	—	—	—
14	<i>Anacanthohecum testaceifrons</i> (Ros.)	●	—	—	—	—	—
15	<i>Miltogramma germari</i> Meig.	●	—	—	—	—	—
16	<i>Miltogramma megerlei</i> Meig.	○	—	—	—	—	—
17	<i>Miltogramma oestraceum</i> Fall.	●	+	—	—	—	—
18	<i>Miltogramma punctatum</i> Meig.	●	—	—	—	+	—
19	<i>Miltogramma taeniatum</i> Meig.	+	+	—	—	—	—
20	<i>Hilarella hilarella</i> (Zett.)	●	—	—	—	—	●
21	<i>Hilarella siphonina</i> (Zett.)	●	—	—	—	—	—
22	<i>Hilarella stictica</i> (Meig.)	●	—	—	—	—	—
23	<i>Paragusia elegantula</i> (Zett.)	●	—	—	—	—	—
24	<i>Phrosinella nasuta</i> (Meig.)	●	—	+	—	—	—
25	<i>Metopia argyrocephala</i> Meig.	●	●	—	—	—	○
26	<i>Metopia campestris</i> (Fall.)	●	+	—	—	—	—
27	<i>Metopia rondaniana</i> Vent.	●	—	—	—	—	—
28	<i>Metopia stackelbergi</i> Rohd.	●	—	—	—	—	—
29	<i>Metopia staegeri</i> Rond.	●	—	—	—	—	—
30	<i>Metopia tshernovae</i> Rohd.	●	—	—	—	—	—
31	<i>Oebalia cylindrica</i> (Fall.)	●	+	+	—	+	●
32	<i>Oebalia minuta</i> (Fall.)	●	●	+	—	+	—
33	<i>Oebalia sachtlebeni</i> Rohd.	+	—	—	—	—	—
34	<i>Oebalia praeclusa</i> (Pand.)	—	—	+	—	+	—
35	<i>Oebalia unistriata</i> Rohd.	—	+	—	—	—	—
36	<i>Helicobosca palpalis</i> R.-D.	●	+	—	—	—	—

1	2	3	4	5	6	7	8
37	<i>Brachicoma devia</i> (Fall.)	●	+	+	—	—	—
38	<i>Nyctia halterata</i> (Panz.)	●	—	—	—	—	—
39	<i>Angiometopa ruralis</i> (Fall.)	●	+	—	—	—	—
40	<i>Agria latifrons</i> (Fall.)	●	—	—	—	—	—
41	<i>Pseudosarcophaga affinis</i> (Fall.)	●	—	+	—	—	●
42	<i>Pseudosarcophaga mamillata</i> (Pand.)	●	+	+	—	—	+
43	<i>Ravinia striata</i> (Fabr.)	●	+	+	+	+	●
44	<i>Blaesoxipha erythrura</i> (Meig.)	+	+	—	—	—	—
45	<i>Blaesoxipha fossaria</i> (Pand.)	●	●	—	—	—	—
46	<i>Blaesoxipha lineata</i> (Fall.)	●	—	—	—	—	—
47	<i>Blaesoxipha unguolata</i> Pand.	+	—	—	—	—	—
48	<i>Bellieria crassimargo</i> (Pand.)	●	+	+	+	—	+
49	<i>Bellieria melanura</i> (Meig.)	●	●	+	+	+	+
50	<i>Bellieria noverca</i> (Rond.)	—	—	+	—	—	—
51	<i>Bellieria rosellei</i> (Bött.)	●	—	—	—	—	—
52	<i>Kramerella setipennis</i> (Rond.)	●	—	+	—	—	—
53	<i>Thyrsochnema incisilobata</i> (Pand.)	●	+	+	—	—	●
54	<i>Sarcotachinella sinuata</i> Meig.	●	—	—	—	—	—
55	<i>Bellieriomima subulata</i> (Pand.)	●	—	—	—	—	—
56	<i>Pierretia clathrata</i> (Meig.)	●	+	+	—	—	—
57	<i>Pierretia granulata</i> (Kram.)	●	—	—	—	—	—
58	<i>Pierretia nigriventris</i> (Meig.)	●	+	+	—	—	+
59	<i>Pierretia rostrata</i> (Pand.)	●	—	—	—	—	—
60	<i>Pierretia villeneuvei</i> (Bött.)	+	—	—	—	—	—
61	<i>Pandelleana protuberans</i> (Pand.)	●	—	—	—	—	—
62	<i>Parasarcophaga albiceps</i> (Meig.)	●	+	+	+	—	+
63	<i>Parasarcophaga aratrix</i> (Pand.)	●	+	+	+	—	+
64	<i>Parasarcophaga argyrostoma</i> R.-D.	●	+	+	+	●	●
65	<i>Parasarcophaga portschinskyi</i> Rohd.	●	—	—	—	—	—
66	<i>Parasarcophaga similis</i> (Pand.)	●	+	+	+	—	—
67	<i>Parasarcophaga tuberosa</i> (Pand.)	●	+	—	—	—	—
68	<i>Parasarcophaga uliginosa</i> (Kram.)	—	—	+	—	—	—
69	<i>Robineauella scoparia</i> (Pand.)	●	+	+	—	—	—
70	<i>Kramerea schuetzei</i> (Kram.)	+	+	+	—	—	—
71	<i>Bercaea haemorrhoidalis</i> (Fall.)	●	+	+	+	●	●
72	<i>Sarcophaga carnaria</i> (L.)	●	●	+	+	+	●
73	<i>Sarcophaga dolosa</i> Lehr.	●	+	+	—	+	●
74	<i>Sarcophaga lehmani</i> Müll.	●	●	+	+	●	●
75	<i>Sarcophaga subvicina</i> Rohd.	●	+	+	+	+	+
76	<i>Sarcophaga schultzi</i> (Müll.)	+	+	+	—	+	—
77	<i>Discochaeta pumila</i> (Meig.)	●	+	—	—	—	—
78	<i>Heteronychia boetcheriana</i> Rohd.	●	—	+	—	—	—
79	<i>Heteronychia dissimilis</i> (Meig.)	●	+	—	—	—	—
80	<i>Heteronychia haemorrhoea</i> (Meig.)	●	—	—	—	—	—
81	<i>Heteronychia nigricauda</i> (Pov Slam.)	+	—	—	—	—	—
82	<i>Heteronychia schineri</i> (Bezzi)	●	+	+	—	—	+
83	<i>Heteronychia vagans</i> (Meig.)	●	—	—	—	—	—
	<i>Rhinophoridae</i>						
84	<i>Angioneura acerba</i> (Meig.)	+	—	—	—	—	—
85	<i>Anthracomyia melanoptera</i> (Fall.)	●	+	+	—	●	—



1	2	3	4	5	6	7	8
86	<i>Frauenfeldia rubricosa</i> (Meig.)	+	+	+	+	+	●
87	<i>Melanomyia nana</i> (Meig.)	●	+	+	—	—	○
88	<i>Melanophora roralis</i> (L.)	●	—	—	—	+	●
89	<i>Rhinomormia sarcophagina</i> (Schin.)	●	—	—	—	—	—
90	<i>Rhinophora lepida</i> (Meig.)	●	+	—	—	—	—
91	<i>Chaetostevenia maculata</i> (Fall.)	●	+	+	—	—	—

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## SARCOPHAGIDAE I RHINOPHORIDAE (DIPTERA) WARSZAWY I MAZOWSZA

### STRESZCZENIE

Na Nizinie Mazowieckiej stwierdzono 83 gatunki muchówek z rodziny *Sarcophagidae* oraz 8 gatunków z rodziny *Rhinophoridae*, co stanowi odpowiednio 65,4% oraz 47,1% fauny tych muchówek znanych z Polski. W Warszawie złowiono 51 gatunków *Sarcophagidae* i 6 gatunków *Rhinophoridae*, co stanowi odpowiednio 61,4% oraz 75% fauny tych muchówek znanych z Mazowsza.

W suburbium Warszawy występuje 46 gatunków, a w zieleni miejskiej 43 gatunki, w tym w parkach — 39, w zieleni osiedlowej — 15, a w centrum — 18 (na placu Konstytucji tylko trzy gatunki z rodziny *Sarcophagidae*: *Sarcophaga lehmani*, *Bercaea haemorrhoidalis* i *Oebalia praeclusa*). Dwa gatunki *Sarcophagidae* są nowe dla fauny Polski: *Miltogramma taeniatum* i *Blaesoxipha ungulata*.

Na Mazowszu, w suburbium Warszawy oraz w zieleni miejskiej najwięcej gatunków należy do elementu europejskiego. W centrum wzrasta udział procentowy gatunków palearktycznych, maleje natomiast udział eurosberyjskich.

Na Nizinie Mazowieckiej przeważają *Rhinophoridae* terenów zadrzewionych (około 90%), natomiast *Sarcophagidae* związane wyłącznie z lasami stanowią kilkanaście procent wszystkich muchówek z tej rodziny znanych z Mazowsza i Warszawy. Na Mazowszu występuje najwięcej gatunków poli- i oligotopowych, mniej liczne są gatunki eury- i stenotopowe. Gatunki politopowe przeważają we wszystkich typach zieleni miejskiej Warszawy.

Na Mazowszu pod względem liczby gatunków przeważają *Sarcophagidae*, które w stadium larwalnym są parazytoidami błonkówek. Znaczną liczbę gatunków stanowią również pantofagi i saprofagi oraz pasożyty ślimaków, dżdżownic, równonogów i szarańczaków. W zieleni miejskiej Warszawy przeważają pasożyty błonkówek, stonóg, dżdżownic i ślimaków oraz

panto-, saprofagi i drapieżniki, nie wnikają natomiast pasożyty ssaków, chrząszczy i szarańczaków.

Większość omawianych muchówek liczniejsza jest na Mazowszu i w suburbium Warszawy niż w zieleni miejskiej. Jedyne pasożyty dżdżownic z rodzaju *Sarcophaga* Meig. oraz pasożyty błonkówek z rodziny *Sphecidae* liczniejsze są w starych parkach miejskich i w zieleni osiedlowej niż na Mazowszu. Saprofagi (głównie koprofagi) również liczniejsze są na terenach zurbanizowanych niż na Nizinie Mazowieckiej.

#### *SARCOPHAGIDAE* I *RHINOPHORIDAE* (DIPTERA) WARSZAWY I MAZOWII

##### РЕЗЮМЕ

В Мазовии констатировано 83 вида двукрылых из семейства *Sarcophagidae* и 8 видов из семейства *Rhinophoridae*, что составляет соответственно 65,4% и 47,1% фауны этих диптер, известных из Польши. В Варшаве собран 51 вид *Sarcophagidae* и 6 видов *Rhinophoridae*, что составляет 61,4% и 75% фауны этих диптер, известных из Мазовии. В субурбии Варшавы констатировано 46 видов рассматриваемых двукрылых, в городской зелени 43 вида, в том числе в парках — 39, в зелени жилых микрорайонов — 15 и в центре города 18 видов. Большинство как на территории Мазовии, так и Варшавы составляют европейские виды. В обоих случаях большинство видов составляли паразиты перепончато крылых по сравнению с паразитами дождевых червей.