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STUDY AREA AND METHODS OF MATERIAL COLLECTING
ON MOIST MEADOWS ON THE MAZOVIAN LOWLAND

ABSTRACT

In this chapter there are described the four basic study plots in moist meadows of the Mazovian Lowland, and also three additional plots investigated only by some authors. Methods of animal sampling are described in relation to the biocenotic layer, and the collected material is presented in the form of tables.

The Mazovian Lowland represents a rural landscape type. Most of its territory is covered with crop fields, orchards and gardens. Only small parts of the land, mainly located in river flood plains, are managed as permanent grasslands. These are mostly meadows and pastures on sites of riverside carrs, wet, often with standing water. In Mazovia moist meadows on the site of oak-hornbeam forests are difficult to find. These are mostly temporary, exploited grasslands occupying small areas on fallows. Almost all of them are in private possession, and usually alternately utilized as mown meadows in spring and then grazed by cattle. For these reasons it was difficult to select study areas, and their number had to be limited to four basic plots (Fig. 1). They are rather diverse in their size, water economy, fertilizing treatment and utilization. All these four meadow plots support vegetation of the association *Arrhenatheretum medioeuropaeum* Br.-Bl.

1. Klembów. The plot located about 40 km north-west of Warsaw, near Thuszcz. This is a 0.5 ha meadow bordering on the nature reserve „Dębina”, which is a 35 ha linden-oak-hornbeam (*Tilio-Carpinetum*) forest. The part of the forest adjoining the meadow represents a low type of the linden-oak-hornbeam forest, thus it is relatively humid. From the other sides, the meadow is surrounded with crop fields. This meadow has recently been established on old fields. It is extensively exploited, being mown once a year in spring and then grazed in autumn.

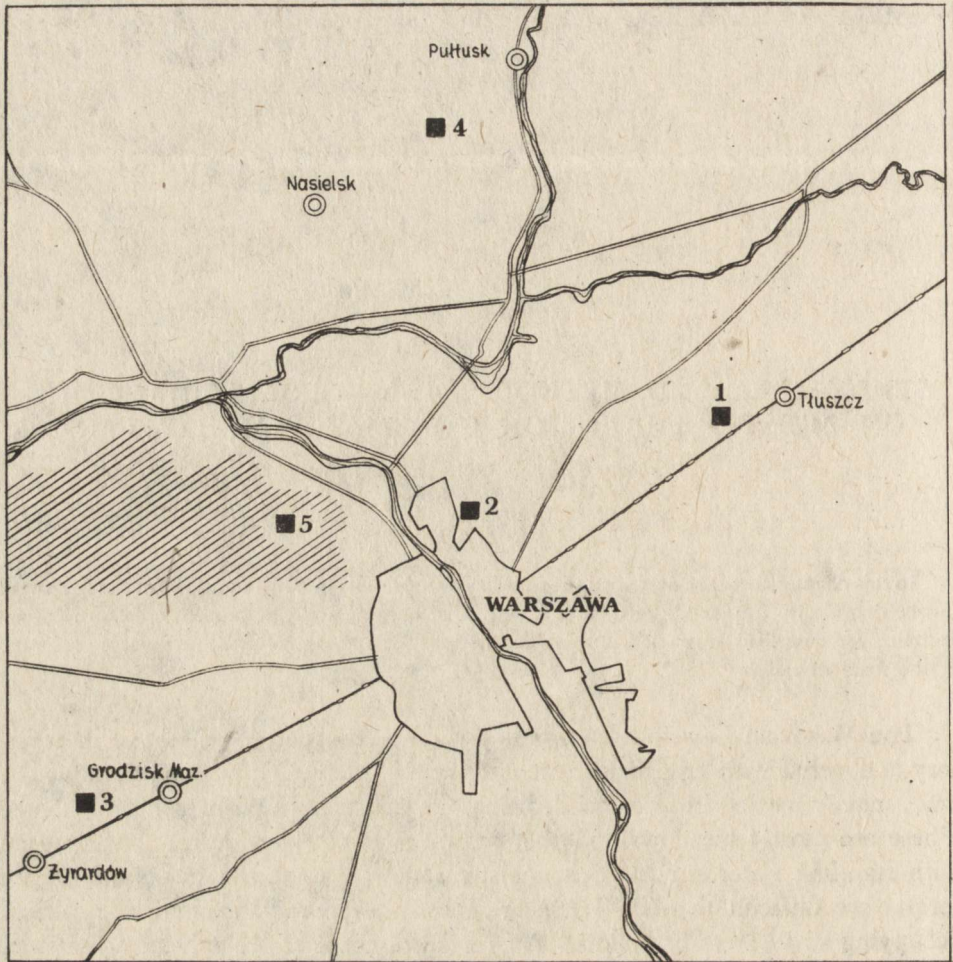


Fig. 1. Study plots on moist meadows of Mazovia: 1 — Klembów, 2 — Białoleka Dworska
3 — Chylice, 4 — Zbroszki, 5 — Cyganka

2. Białoleka Dworska. It is located 14 km off the centre of Warsaw, and constitutes a part of a peripheral part of the Praga-Północ district of Warsaw. Now this is a typical suburban area with one-family housing, croplands and gardens.

The study meadow (C) is located on the site of a rich linden-oak-hornbeam forest. To the north it borders on a dry river bed (a narrow strip of *Circaeo-Alnetum*), and from the other sides it is surrounded with crop fields. It covers an area about 1 ha and is mown and grazed. Its floral composition is rich: 37 species of herbaceous plants (Roo-Zielińska 1981).

Additionally fauna was also studied to some extent on two other meadows established on the linden-oak-hornbeam site. Their areas did not exceed 0.5 ha.

They both have been exploited for a long time. Separated from each other with a cart road, on one side they bordered on a small linden-oak-hornbeam forest, and on the other sides they were surrounded with crop fields. These meadows differed in the way of management: meadow A was unfertilized, not cultivated, meadow B was minerally fertilized and mown twice a year. This situation continued during the study period on soil fauna in 1980–1981.

3. Chylice. Experimental meadow of the Academy of Agriculture located about 40 km south-west of Warsaw, near Jaktorów. This is the largest plot, covering about 7 ha. It abuts on an alder-ash carr (*Circaeo-Alnetum*) on the south, a road and farm buildings on the east, and a large intensely grazed pasture on the other sides. It is fenced and it has been mown for about last 30 years. Intense mineral fertilizing is applied there, and hay is harvested three times a year.

4. Zbroszki. This plot is located about 60 km north of Warsaw, near Pułtusk. This is a small private meadow covering an area of less than 0.5 ha. It has been established recently on the site of a partly cleared orchard. It is isolated from adjoining crop fields by a dense hedgerow. It is located close to an old orchard and farm buildings. Extensively used, unfertilized, occasionally mown in spring, then rather intensely grazed. The plant community evolves towards a pasture (*Cynosurion*).

5. Nature reserve "Cyganka". Located near Truskaw, in the Kampinos National Park. This is an additional plot and because of a mosaic character of the site and floral composition only some authors collected materials there. Fauna was sampled by a sweep-net method only in the part of the meadow adjoining a linden-oak-hornbeam forest (*Tilio-Carpinetum*) and classified to *Arrhenatheretum medioeuropaeum* by Kotowska in 1982. The material of well flying insects captured there was, however, so influenced by the fauna of surrounding wet meadows (*Molinietalia*) that it could not have been used for the analysis of the fauna of moist meadows.

METHODS AND MATERIAL

Zoocoenological studies on sites of moist forests were continued from 1976 to 1984. Also grassland communities were investigated at the same time. At Klembów the study was carried out in 1980–1981. In Białoleka, all kinds of materials were collected from the grazed-mown meadow in 1976–1977, and only soil and epigeal fauna from plots A and B in 1980–1981. On the experimental meadow at Chylice material was intensely collected for three years between 1981 and 1983. Only soil samples, for technical reasons, were collected in the course of two years, 1982–1983. At Zbroszki the material was collected in the period 1983–1984.

The same methods of material collecting, specific of different faunal groups, were used throughout the study. The following biocoenotic layers were distinguished on the meadows: soil, epigeal layer, and herb layer.

SOIL FAUNA

Earthworms (*Lumbricidae*) were extracted from the soil by Satchell (1967) method, with 3% formalin solution. Biocoenometric frame of 0.33 m² was used for sampling earthworms. On each date three such samples were taken from each plot, and there were three sampling periods per season. At Chylice in 1983 only spring samples were taken.

Enchytraeids (*Enchytraeidae*) were sampled with a soil corer 20 cm² in surface area and 5 cm deep. Ten samples were taken from each plot. The animals were being extracted with an O'Connor apparatus for 3 hours. More than 800 individuals of *Enchytraeidae* were collected.

Springtails (*Collembola*) and acarids (*Acarina*) were sampled with a similar soil corer to a depth of 10 cm. Ten samples were taken from each plot. Samples were taken each month from April to October. Only in 1983 at Chylice, sampling was continued in winter. Animals were extracted with a Tullgren apparatus. More than 43 thousand individuals were collected (Tab. 1).

Soil macrofauna. Ten soil samples of a joint surface area of 1 m² were taken three times a season, and extracted in a large Tullgren apparatus. In addition, five times a season, samples were taken with a soil corer of 17 cm in diameter and animals were extracted by hand. A total of more than 8.500 individuals was collected (Tab. 1).

EPIGEAN FAUNA

Epigeal animals, which penetrate the surface layer of the soil, were captured with Barber pitfall traps — glass cylinders 4 cm in diameter, filled with a preserving fluid and buried in soil so that edges were at the soil surface level. A series of samples consisted of 20 traps exposed for 14 days on each plot. These samples were taken from early spring to early winter. In this way about 400 thousand individuals were collected (Tab. 2).

FAUNA OF THE HERB LAYER

An entomological sweep-net was used for sampling the fauna associated with herbaceous plants. On each occasion, 10 sweep-net samples were taken, each sample consisting of a 25 sweeps in the grass of a selected part of the meadow.

Table 1. The number of individuals extracted from soil samples taken from the meadow plots

Group	Locality	Klembów	Białoleka A	Białoleka B	Białoleka C	Chylice	Zbroszki	Total
<i>Acarina</i>		5,013	7,761	5,066	6,157	10,664	4,099	38,760
<i>Collembola</i>		1,604	4,686	4,005	764	2,705	2,003	15,767
Macrofauna		2,793	683	3,349	957	913	—	8,695

Table 2. The number of epigean animals caught in Barbar's pitfall traps on the meadow plots

Group	Locality	Klembów	Białoleka A	Białoleka B	Białoleka C	Chylice	Zbroszki	Total
<i>Gastropoda</i>		297	836	943	226	82	32	2,416
<i>Isopoda</i>		3	170	33	140	9	8	363
<i>Chilopoda</i>		8	19	29	11	25	6	98
<i>Diplopoda</i>		1	134	173	7	1	8	324
<i>Aranei</i>		1,229	1,690	1,455	1,023	3,065	1,074	9,536
<i>Opiliones</i>		30	544	269	47	55	15	960
<i>Orthoptera, Blattoidea</i>		4	20	49	72	291	60	496
<i>Dermaptera</i>		—	57	33	76	11	103	280
<i>Heteroptera</i>		—	33	51	—	21	—	105
<i>Hymenoptera</i>		—	—	—	—	542	236	778
<i>Coleoptera</i> imagines		874	2,157	1,804	1,673	2,315	655	9,478
<i>Coleoptera</i> larvae		630	521	345	86	297	193	2,072
<i>Diptera</i> larvae		534	78	9	4	18	30	673
<i>Lepidoptera</i> larvae		28	41	29	8	100	59	265
<i>Formicidae</i>		537	3,669	1,894	819	46	4,406	11,371
<i>Symphyta</i> larvae		18	24	26	—	—	—	68
<i>Varia</i>		—	—	—	143	242	415	800
Total		4,193	9,993	7,142	4,335	7,120	7,300	40,083

Table 3. The number of invertebrate individuals caught with an entomological sweep-net on the moist meadows

Group	Klembów 1980-81	Białoleka 1976-77	Chylice 1981-83	Zbroszki 1983-84	Total
<i>Orthoptera</i>	30	171	3,100	209	3,510
<i>Psocoptera</i>	4	1	77	3	85
<i>Thysanoptera</i>	6,407	96	2,743	757	10,003
<i>Homoptera</i>					
<i>Auchenorrhyncha</i>	4,579	965	17,686	16,230	39,460
<i>Psyllodea</i>	20	11	86	47	164
<i>Aphidodea</i>	443	589	3,531	1,507	6,070
<i>Heteroptera</i>	1,467	557	2,566	937	5,527
<i>Coleoptera</i>	529	981	2,110	776	4,396
<i>Neuropteroidea</i>	6	4	34	6	50
<i>Hymenoptera</i>	2,290	777	7,783	3,590	14,440
<i>Lepidoptera</i>	15	74	118	39	246
<i>Diptera</i>	8,847	6,950	32,074	17,220	65,091
<i>Aranea, Opiliones</i>	1,027	375	1,312	276	2,990
Others	108	117	890	186	1,301
Total	25,706	11,668	73,623	41,783	153,333

Table 4. The number of individuals caught in Moericke's yellow pan traps placed in grass on the plot at Chylice

Group	1981	1982	1983	Total
<i>Orthoptera</i>	195	251	490	936
<i>Psocoptera</i>	28	39	105	172
<i>Thysanoptera</i>	343	388	2,672	3,403
<i>Homoptera</i>				
<i>Auchenorrhyncha</i>	2,569	2,151	4,190	8,910
<i>Psyllodea</i>	—	18	26	44
<i>Aphidodea</i>	317	871	579	1,767
<i>Heteroptera</i>	27	165	76	268
<i>Coleoptera</i>	462	624	1,179	2,265
<i>Neuroptera</i>	—	10	2	12
<i>Hymenoptera</i>	3,410	2,202	4,696	10,508
<i>Lepidoptera</i>	17	43	75	135
<i>Diptera</i>	7,689	9,783	22,472	39,944
<i>Aranea, Opiliones</i>	2,013	1,099	2,203	5,315
Others	198	35	369	602
Total	17,263	34,942	39,334	74,281

This sampling was done every seven days if the weather permitted. About 153 thousand invertebrate individuals were collected over the study period (Tab. 3).

In addition to the sweeping method, which was used on all the study meadows, at Chylice also other quantitative methods were used for comparative purpose. Three Moericke yellow pan traps filled with a preserving solution were exposed in the grass, and the animals caught were removed every 7 days throughout the study period. More than 74 thousand individuals were collected (Tab. 4) during three years of the study. Identical three yellow pan traps were placed on stakes 50 cm above ground. Moreover, three Malaise traps were placed on the soil surface and checked at 14-day intervals. Also three transparent glass panes fastened on racks were hung perpendicularly above oblong containers with a preserving fluid, placed in the grass. Their total surface area was 1 m². This method proved to be very efficient. More than 70 thousand individuals were caught in the course of a season. In addition, biocoenometers and suction apparatuses were used.

The total material collected by all the methods together exceed 400 thousand individuals of invertebrate associated with herbaceous plants.

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OPIS TERENU BADAŃ ORAZ METOD ZBIERANIA MATERIAŁU NA ŁĄKACH ŚWIEŻYCH NIZINY MAZOWIECKIEJ

STRESZCZENIE

Podano opis 7 powierzchni badawczych łąk położonych w Klembowie, Białoleka Dworskiej (3 stanowiska), Chylicach, Zbroszkach i w Cygance (Puszcza Kampinowska). Omówiono ilościowe metody odłowu zwierząt bezkręgowych zastosowane w niniejszym zbiorze prac. Dostosowane one były do badanych warstw biocenotycznych: edafonu, epigeonu i epifitonu. W tabelach 1-4 podano ilościowe zestawienie zebranego materiału z badanych powierzchni.

ХАРАКТЕРИСТИКА ИССЛЕДОВАННОЙ ТЕРРИТОРИИ И МЕТОДОВ СБОРА МАТЕРИАЛА НА СВЕЖИХ ЛУГАХ МАЗОВЕЦКОЙ НИЗМЕННОСТИ

РЕЗЮМЕ

Описаны семь пробных площадок, лежащих в Клембове, Бялоленке-Дворской (3 станции), Хылицах, Зброшках и в Цыганке. Методы, примененные при количественном отлове животных, были различны и приспособлены к исследуемому биоценотическому ярусу. Животные были собраны в почве, в эпигеоне и в эпифитоне. Количественная сводка собранного материала представлена в таблицах 1—4.