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**Crane-flies (*Diptera*, *Limoniidae*) of the Świętokrzyskie Mountains.  
Part. II. *Limoniidae* of the Łysogóry Chain**

[With 1 table and 1 figure in the text]

**Abstract.** *Diptera* of the family *Limoniidae* inhabiting forests and open areas of the Łysogóry Chain of the Świętokrzyskie Mountains were investigated. 106 species were recorded, 10 of which are new for the Polish fauna.

INTRODUCTION

In the Świętokrzyskie Mountains up till now only the crane-fly fauna of the Lubrzanka River valley was studied (KRZEMIŃSKI, WIEDEŃSKA 1982; WIEDEŃSKA 1986, 1987).

The present study concerns the highest range of the Świętokrzyskie Mountains, the Łysogóry Chain, which extends from Mount Łysica (612 m) on the north-west to Mount Łysa Góra (595 m) on the south-east. Part of Łysogóry Chain is protected, and the borders of the Świętokrzyski National Park run along the limit of forests covering this range and the Chełmowa Mount.

The present investigations were carried out as a part of the faunistic project MR II-3, which was coordinated by the Institute of Zoology of the Polish Academy of Science.

The aim of the present study was to enrich the knowledge of the occurrence of a little known family of *Diptera* and to describe the differences in the specific composition of *Limoniidae* of forest and meadow areas.

I extend sincere thanks to my friends, Dr. J. MAJECKI, Dr. S. NIESIOŁOWSKI and Dr. J. SICIŃSKI, for giving me access to their collections of *Limoniidae*.

## MATERIAL AND METHODS

In the investigated area, in the period from 1982 to 1985, 157 samples were collected in 47 stations. 27 stations (80 samples) were situated in open areas of the southern and northern slopes of the Lysogóry Chain; these open areas are mainly shrubs and meadows occurring along the streams as well as areas close to villages. 17 stations (59 samples) were situated in the forested area of the Lysogóry Chain. This last group of stations and two stations situated in marshy areas strict reserves (14 samples) are stations situated within the borders of the Świętokrzyski National Park. The study also included one station (N<sup>o</sup> 105) where four samples were collected in light traps on the slope of the Mount Łysa Góra. These samples were not considered in the comparison of ecologically different areas.

Except of station 105, all other samples were collected monthly using an entomological net 40 cm in diameter in the period from spring 1982 to autumn 1985. The material comprises 2150 imago specimens of *Limoniidae*. To make samples comparable, they were collected each time for 30 minutes. All the crane-flies obtained were preserved in 75% alcohol or fixed in permanent slides and remain within the collection of the Department of Invertebrate Zoology and Hydrobiology of the University of Łódź.

Species dominance in the material (D) was calculated as a percentage of specimens of this species to all insects collected; the frequency of particular species in samples (F) was determined as a percentage of samples containing particular species in relation to all samples; the species frequency in stations (C) – as a percentage of stations, in which particular species was recorded.

Despite the fact that SAVČENKO (1982, 1985, 1986) proposes considerable changes in the taxonomy and systematics of *Limoniidae* the autor has retained the system of her first study on crane-fly fauna of the Świętokrzyskie Mountains (WIEDEŃSKA 1986).

Zoogeographical classification was given after SAVČENKO (1982, 1985, 1986), NOLL (1985) and REUSCH (1988).

## STUDY AREA

The present investigations concerned highest range of the Świętokrzyskie Mountains, the Lysogóry Chain. Stations were situated in the area of the Świętokrzyski National Park and its surroundings (Fig. 1). This area was investigated in detail in 1982–1984 by the team of the Department of Invertebrate Zoology and Hydrobiology University of Łódź. A detailed description of the study area and of the investigation stations was given by PIECHOCKI (1986). The numeration of stations which is used below is congruent with that used in the above study.

To compare the species composition of *Limoniidae* in various habitats, the stations were grouped depending on their ecological character. Forested, non-forested and marshy stations were distinguished.

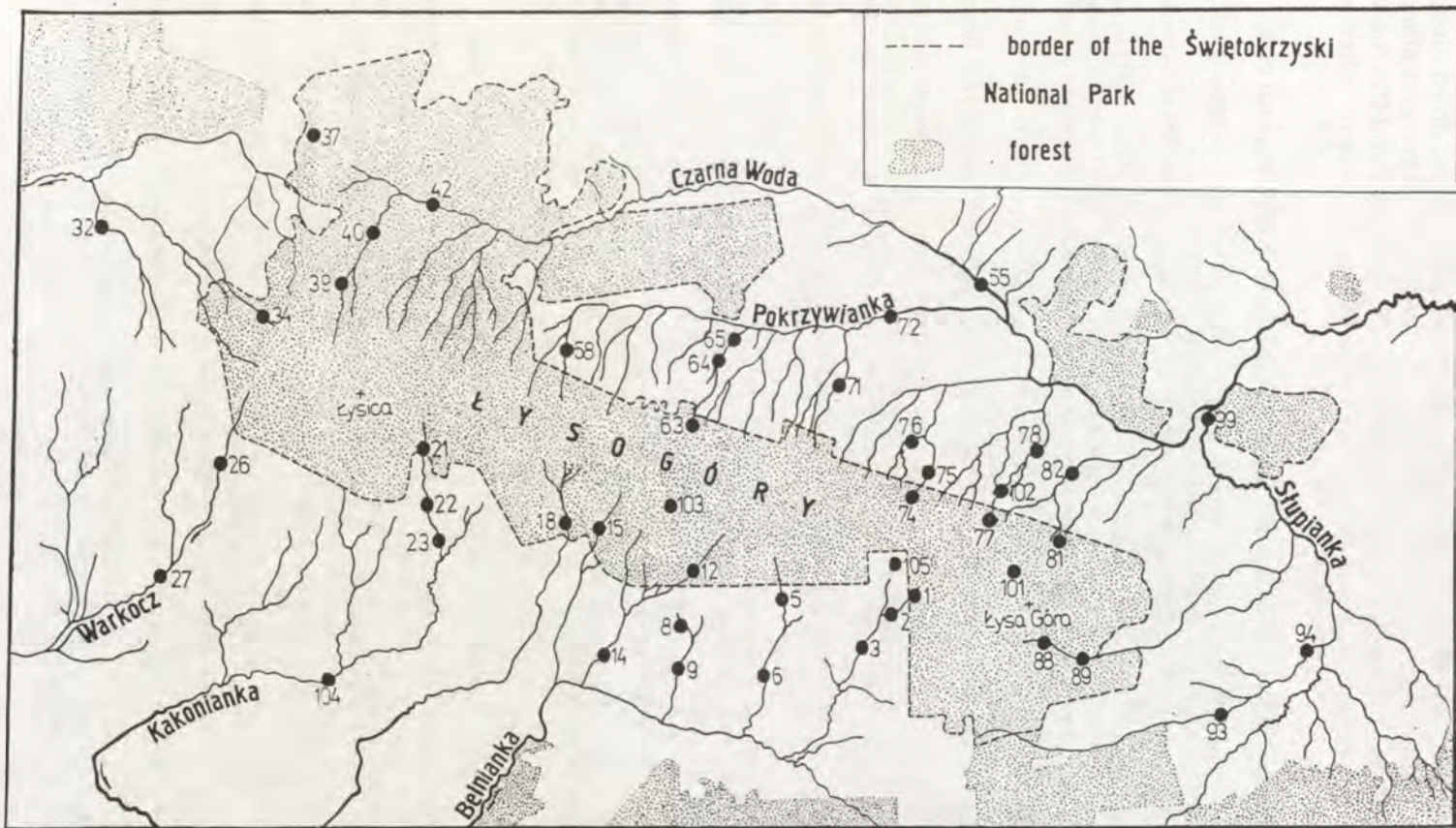


Fig. 1. Distribution of the investigated stations.

Most of the stations were situated close to streams flowing down along the southern slopes of the Łysogóry Chain to the Belnianka River and along the northern slopes of this mountain range to the Pokrzywianka and Czarna Woda Rivers. Only several stations were situated far from streams or other water bodies, and then it is indicated below.

#### **A. Midforest stations situated in the area of the Świętokrzyski National Park:**

1. The Belnianka River source sector upstream of the village of Huta Szklana (6 samples).
12. Midforest sector of the Jastrzębi Dół Stream (1 sample).
15. Midforest tributary of the Belnianka River close to forest-sectors 183 and 184 of Świętokrzyski National Park (1 sample).
18. Forest on the tributary of the Belnianka River upstream of the village of Podlesie (1 sample).
21. At the source sector of the Kakonianka Stream upstream of the village of Kakonin (3 samples).
34. The village of Święta Katarzyna. Forest close to the stream flowing from the source of the Święty Franciszek Spring (1 sample).
39. Tributary emptying into the Czarna Woda River at its source sector, between the village of Święta Katarzyna and village of Bodzentyn (6 samples).
40. Tributary emptying into the Czarna Woda River upstream of the "Czarny Las" Reserve (6 samples).
63. Source sector of the tributary of the Pokrzywianka River, which flows towards the village of Dębno (11 samples).
70. Source sector of the tributary of the Pokrzywianka River, which flows towards the village of Jezioro (1 sample).
74. Forest sector of the tributary of the Pokrzywianka River, which flows towards the village of Bielów (2 samples).
77. Source sector of the tributary of the Pokrzywianka River, which flows towards the village of Mirocice (3 samples).
81. Forest sector of tributary of the Pokrzywianka River, which flows towards the village of Baszowice (1 sample).
88. Forest sector of the Słona Woda Stream, close to the red tourist route leading from Mount Łysa Góra to the Jeleniowskie Chain (2 samples).
89. Forest sector of the Słona Woda Stream upstream of the village of Nowa Słupia (3 samples).
01. Village of Święty Krzyż. Pine beech forests on Mount Łysa Góra, far from streams (9 samples).
03. Mixed forest overgrowing the Łysogóry Chain close to the red tourist route, approximately half way between Mount Łysica and Mount Łysa Góra (2 samples).

#### **B. Meadow stations on southern and northern slopes of the Łysogóry Chain:**

2. Insolated meadows at the Belnianka River, upstream of the village of Huta Szklana (8 samples).
3. Meadows at the Belnianka River in the village of Huta Stara. Banks overgrown with dense shrubs (13 samples).
5. The village of Podłysica. Insolated meadows and small patches of marshy vegetation around the sources of the tributary of the Belnianka River (1 sample).
6. Meadows at tributary of the Belnianka River, between the villages of Podłysica and Huta Nowa (1 sample).
8. Meadows and low marshy vegetation around the sources of the tributary of the Belnianka River, downstream of the village of Podłysica (1 sample).
9. Tributary of the Belnianka River, between the villages of Podłysica and Huta Nowa-Folwark; dense shrubs (1 sample).
14. Dense shrubs at the Jastrzębi Dół Stream, upstream of the village of Bieliny Poduchowne (2 samples).
22. Insolated meadows at the Kakonianka Stream, upstream of the village of Kakonin (6 samples).
23. Meadows and dense shrubberies at the Kakonianka Stream, downstream of the village of Kakonin (7 samples).

26. Shrubberies in the gorge of the Warkocz Stream, upstream of the village of Krajno (2 samples).
27. Meadows and shrubberies at the banks of the Warkocz Stream (3 samples).
32. The village of Wilków. Meadows at strongly insolated sector of the left tributary of the Lubrzanka River (3 samples).
55. Village of Łomno. Shrubberies on the banks of the Czarna Woda River (1 sample).
58. Meadows at the tributary of the source sector of the Pokrzywianka River, upstream of the village of Wola Szczygielkowa (1 sample).
64. Insolated meadows at the tributary of the Pokrzywianka River upstream of the village of Dębno (8 samples).
65. Meadows and beech shrubberies at the banks of the Pokrzywianka River in the village Dębno (5 samples).
71. Insolated meadow sector of the tributary of the Pokrzywianka River upstream of the village of Jeziorko (1 sample).
72. Village of Jeziorko. Meadows at the Pokrzywianka River (1 sample).
75. Meadows and shrubberies at the tributary of the Pokrzywianka River flowing towards the village of Bielów, about 100 m below the border of forest (1 sample).
76. Insolated meadows at the tributary of the Pokrzywianka River upstream of the village of Bielów (1 sample).
78. Insolated, wet meadows on the banks of the tributary of the Pokrzywianka River close to the village of Mikroćce (1 samples).
82. Meadows and shrubberies of the tributary of the Pokrzywianka River upstream of the village of Baszowice (2 sample).
93. The village of Dębniak. Meadows and shrubberies at the Łagowianka Stream (1 sample).
94. Meadow sector of the Łagowianka Stream upstream of the village of Nowa Słupia (2 samples).
99. The village of Serwis. Meadows and shrubberies at the confluence of the Pokrzywianka and Słupianka Rivers (4 samples).
102. Meadows and beech shrubberies at the tributary of Pokrzywianka River flowing towards the village of Miroćce, upstream of the village of Hucisko (2 samples).
104. The village of Bieliny Kapitulne. Shrubberies and meadows at the Kakonianka Stream near the bridge in the village (1 sample).

#### C. Stations situated in marshy areas (within the Świętokrzyski National Park):

37. "Mokry Bór" Reserve. Marshy vegetation close to numerous midforest, small dystrophic water bodies (5 samples).
42. "Czarny Las" Reserve. Large areas of wet meadows with rush (*Juncus* sp.) and sedge (*Carex* sp.) and midforest marshy vegetation within and above the area of the reserve (9 samples).

#### D. Other stations:

105. The village of Huta Szklana (Jodłowy Dwór). 4 samples collected in the course of four about three hours long light sessions.

## RESULTS

In the collected material 106 species of the *Limoniidæ* were recorded; 67 of them had already been recorded in the Świętokrzyskie Mts (WIEDEŃSKA 1986), while 39 species are new for this region; this latter number also includes 10 species identified in the area of Poland for the first time. The complete species list of the collected material is given in the Table I.

Table I. List of species.

| No  | Species  | Number of stations  | NP | Month     | Coefficient |             |             | ZG  |
|-----|--|---|----|-----------|-------------|-------------|-------------|-----|
|     |  |   |    |           | D (%)       | C (%)       | F (%)       |     |
| 1   | 2  | 3   | 4  | 5         | 6           | 7           | 8           | 9   |
| 1   | <i>Limonia (L.) flavipes</i> (FABR.)             | 1, 3, 14, 22, 26, 63, 65, 81, 101                             | +  | V, VI     | 2.1         | 21.3        | 8.9         | wP  |
| 2   | <i>Limonia (L.) macrostigma</i> (SCHUMM.)        | 3, 9, 14, 23, 40, 42, 63-65, 71, 76, 104                      | +  | V-VIII    | 0.8         | <u>25.5</u> | 3.2         | tP  |
| 3   | <i>Limonia (L.) nigropunctata</i> (SCHUMM.)      | 42, 99  | +  | V, VI     | 0.2         | 4.3         | 1.3         | aP  |
| 4   | <i>Limonia (L.) nubeculosa</i> MG.               | 1, 3, 12, 18, 21-23, 39, 63, 74, 77, 81, 88, 89, 99, 101, 103 | +  | V-IX      | <u>4.5</u>  | <u>36.2</u> | <u>16.6</u> | HtP |
| °5  | <i>Limonia (L.) stigma</i> MG.                   | 99  |    | VII       | 0.1         | 2.1         | 0.6         | E   |
| 6   | <i>Limonia (L.) tripunctata</i> (FABR.)          | 1, 3, 9, 14, 23, 42, 63-65, 77, 99, 101, 102                  | +  | V, VI     | <u>4.8</u>  | <u>27.7</u> | <u>12.1</u> | HwP |
| 7   | <i>Limonia (L.) trivittata</i> (SCHUMM.)         | 9, 99   |    | VII       | 0.1         | 4.3         | 1.3         | EmA |
| 8   | <i>Limonia (Metalimnobia) quadrinotata</i> (MG.) | 3, 21, 40, 63, 74, 99, 104, 105                               | +  | V-VIII    | 0.4         | 17.0        | 5.1         | Ptb |
| °9  | <i>Limonia (Atypophthalmus) inusta</i> (MG.)     | 3   |    | VI        | 0.1         | 2.1         | 0.6         | aP  |
| °10 | <i>Dicranomyia (D.) autumnalis</i> (STAEGL.)     | 23, 102   |    | VI, VIII  | 0.1         | 4.3         | 1.3         | E   |
| °11 | <i>Dicranomyia (D.) chorea</i> (MG.)             | 3, 22, 23, 27, 101, 105                                       | +  | V-VII, IX | 0.5         | 12.8        | 5.1         | HwP |
| 12  | <i>Dicranomyia (D.) didyma</i> (MG.)             | 23  |    | VII, VIII | 0.4         | 2.1         | 1.3         | wP  |
| °13 | <i>Dicranomyia (D.) dumetorum</i> (MG.)          | 37, 39  |    | VI        | 0.1         | 4.3         | 1.3         | E   |
| 14  | <i>Dicranomyia (D.) frontalis</i> (STAEGL.)      | 3, 23, 65   |    | VIII, IX  | 0.2         | 6.4         | 1.9         | HtP |
| °15 | <i>Dicranomyia (D.) fusca</i> (MG.)              | 3, 23, 40, 88   | +  | VI-IX     | 0.3         | 8.5         | 3.8         | H   |

| 1    | 2   | 3  | 4 | 5             | 6          | 7           | 8           | 9     |
|------|---|--|---|---------------|------------|-------------|-------------|-------|
| 16   | <i>Dicranomyia (D.) modesta</i> (MG.)               | 2, 3, 9, 22, 26, 42, 63-65, 71, 82, 89, 101-103      | + | V-X           | <u>5.4</u> | <u>31.9</u> | <u>15.3</u> | H     |
| °17  | <i>Dicranomyia (Melanolimonia) morio</i> (FABR.)    | 71   |   | VIII          | 0.1        | 2.1         | 0.6         | EmA   |
| °18  | <i>Rhipida duplicata</i> (DOANE)                    | 2, 3, 42, 58, 77, 101, 102, 104, 105                 | + | V-VII, IX     | 1.0        | 19.2        | 7.6         | H     |
| 19   | <i>Helius flavus</i> (WALK.)                        | 42   | + | VI            | 0.1        | 2.1         | 0.6         | aP    |
| 20   | <i>Helius iongirostris</i> (MG.)                    | 1, 3, 42, 63-65, 71, 93, 105                         | + | V-VIII        | 0.7        | 19.2        | 6.4         | aP    |
| 21   | <i>Antocha (A.) vitripennis</i> (MG.)               | 99   |   | V, VII        | 0.2        | 2.1         | 1.3         | E     |
| °22  | <i>Dicranoptycha (D.) fuscescens</i> (SCHUMM.)      | 14, 99   |   | VI, VII       | 0.1        | 4.3         | 1.3         | wP    |
| 23   | <i>Dicranoptycha (D.) paralivescens</i> (STARÝ)     | 65, 99   |   | VII           | 0.2        | 4.3         | 1.3         | ?me   |
| °24  | <i>Ula (U.) mollissima</i> HAL.                     | 1, 21, 101   | + | V, VI         | 0.2        | 6.4         | 2.6         | wP    |
| 25   | <i>Pedicia (P.) rtvosa</i> (L.)                     | 22, 39, 40, 63, 77, 82, 99                           | + | V, VII-VIII   | 0.5        | 14.9        | 5.1         | E     |
| °26  | <i>Pedicia (Crunobia) straminea</i> (MG.)           | 21, 39, 40, 63, 88, 89                               | + | V-VI, VIII-IX | 1.6        | 12.8        | 5.7         | E     |
| °27  | <i>Pedicia (C.) littoralis</i> (MG.)                | 14   |   | VI            | 0.1        | 2.1         | 0.6         | E     |
| °°28 | <i>Pedicia (C.) zernyi pallens</i> SAV.             | 2, 3, 22, 23, 94                                     |   | V-VI          | 0.3        | 10.6        | 3.2         | ?E    |
| 29   | <i>Tricyphona immaculata</i> (MG.)                  | 1-3, 22, 23, 32, 39, 40, 42, 63, 64, 78, 89, 94, 105 | + | V-VI, VIII-IX | 2.5        | <u>31.9</u> | <u>12.7</u> | EmA   |
| °°30 | <i>Tricyphona schummeli</i> EDW.                    | 1, 37, 40  | + | V             | 0.5        | 6.4         | 2.6         | E, bm |
| 31   | <i>Tricyphona unicolor</i> (SCHUMM.)                | 40   | + | V             | 0.1        | 2.1         | 1.3         | E     |
| 32   | <i>Dicranota (D.) bimaculata</i> (SCHUMM.)          | 2, 3, 22, 23, 32, 42, 63, 64                         | + | IV-V, IX      | 1.4        | 17.0        | 7.0         | E     |
| °33  | <i>Dicranota (Paradicranota) brevicornis</i> BERGR. | 40   | + | IX            | 0.1        | 2.1         | 0.6         | E, ?m |
| °34  | <i>Dicranota (P.) subtilis</i> LOEW                 | 2, 63  | + | VIII, IX      | 0.3        | 4.3         | 1.3         | wP    |
| °°35 | <i>Paradelphomyia (Oxyrhiza) fuscula</i> (LOEW)     | 39, 63, 65   | + | VIII          | 0.2        | 6.4         | 1.9         | wP    |
| 36   | <i>Epiphragma (E.) ocellaris</i> (L.)               | 22, 26, 94   |   | V, VI         | 0.1        | 6.4         | 1.9         | H     |
| 37   | <i>Austrolimnophila (A.) ochracea</i> (MG.)         | 3, 22, 63  | + | V, VI         | 0.4        | 6.4         | 2.6         | wP    |

| 1    | 2  | 3   | 4 | 5          | 6          | 7           | 8           | 9     |
|------|--|---|---|------------|------------|-------------|-------------|-------|
| 38   | <i>Austrolimnophila</i> ( <i>Archilimnophila</i> ) <i>unica</i> O.-S.  | 22, 39, 81                                  | + | V          | 0.2        | 6.4         | 1.9         | HbmP  |
| 39   | <i>Pseudolimnophila lucorum</i> (MG.)                                  | 3, 5, 8, 26, 27, 64, 71, 82                 |   | V-VIII     | 1.1        | 17.0        | 6.4         | EmA   |
| 40   | <i>Pseudolimnophila septium</i> (VERR.)                                | 3, 5, 23, 63, 64, 71, 76                    | + | V-VIII     | 0.6        | 14.9        | 5.7         | EmA   |
| °41  | <i>Limnophila</i> ( <i>L.</i> ) <i>pictipennis</i> (MG.)               | 99  |   | V          | 0.1        | 2.1         | 0.6         | Ptb   |
| 42   | <i>Limnophila</i> ( <i>L.</i> ) <i>punctata</i> (SCHRK)                | 23, 32, 42                                  | + | IV-VI      | 1.0        | 6.4         | 3.2         | E     |
| 43   | <i>Eloeophila maculata</i> (MG.)                                       | 2, 3, 9, 22, 23, 26, 39, 63-65, 71, 93, 102 | + | V-VIII     | 2.0        | <u>27.7</u> | <u>10.8</u> | wP    |
| 44   | <i>Eloeophila submarmorata</i> (VERR.)                                 | 2, 12, 39, 63, 82, 104                      | + | V-VIII     | 0.8        | 12.8        | 4.5         | wP    |
| °45  | <i>Eloeophila trimaculata</i> (ZETT.)                                  | 2, 3, 22, 23, 39, 63                        | + | V-VI       | 0.9        | 12.8        | 4.5         | E, bm |
| °46  | <i>Idioptera fasciata</i> (L.)   | 37  | + | V          | 0.7        | 2.1         | 0.6         | Ptb   |
| 47   | <i>Idioptera pulchella</i> (MG.)                                       | 37  | + | V-VI, VIII | <u>4.4</u> | 2.1         | 3.2         | Ptb   |
| 48   | <i>Phylidorea</i> ( <i>Ph.</i> ) <i>ferruginea</i> (MG.)               | 32  |   | V          | 0.1        | 2.1         | 0.6         | EmA   |
| °49  | <i>Phylidorea</i> ( <i>Ph.</i> ) <i>glabricula</i> (MG.)               | 1, 42, 70                                   | + | V-VI, VIII | 0.2        | 6.4         | 2.6         | Ptb   |
| 50   | <i>Phylidorea</i> ( <i>Ph.</i> ) <i>nigricollis</i> (MG.)              | 32, 42, 99                                  | + | V, VI      | 0.4        | 6.4         | 1.9         | E     |
| 51   | <i>Phylidorea</i> ( <i>Ph.</i> ) <i>squalens</i> (ZETT.)               | 2, 37, 40, 42                               | + | V-VI       | <u>5.3</u> | 8.5         | 4.5         | Ptb   |
| °°52 | <i>Phylidorea</i> ( <i>Euphylidorea</i> ) <i>aperta</i> (VERR.)        | 58, 63                                      | + | VI, VII    | 0.1        | 4.3         | 1.3         | E     |
| 53   | <i>Phylidorea</i> ( <i>E.</i> ) <i>fulvonervosa</i> (SCHUMM.)          | 1, 3, 5, 75, 102                            |   | V-VII      | 0.9        | 10.6        | 3.8         | aP    |
| 54   | <i>Phylidorea</i> ( <i>E.</i> ) <i>lineola</i> (MG.)                   | 1-3   | + | V, VI      | 0.1        | 6.4         | 1.9         | E     |
| 55   | <i>Phylidorea</i> ( <i>E.</i> ) <i>phaeostigma</i> (SCHUMM.)           | 1, 2, 63, 75                                |   | V-VIII     | 1.3        | 8.5         | 3.8         | aP    |
| °56  | <i>Neolimnomyia</i> ( <i>N.</i> ) <i>batava</i> (EDW.)                 | 2   |   | VI         | 0.1        | 2.1         | 0.6         | E     |
| 57   | <i>Neolimnomyia</i> ( <i>Brachylimnophila</i> ) <i>nemoralis</i> (MG.) | 3, 5, 6, 22, 63, 64, 76, 99, 102, 105       | + | V-VII      | 0.6        | 21.3        | 7.0         | tP    |
| 58   | <i>Pilarta discicollis</i> (MG.)                                       | 3, 23, 64, 99                               |   | V-VIII     | 0.3        | 8.5         | 3.2         | E     |
| °59  | <i>Pilarta fuscipennis</i> (MG.)                                       | 63  |   | VIII       | 0.1        | 2.1         | 0.6         | wP    |
| °°60 | <i>Pilarta meridiana</i> (STAEGL.)                                     | 6   |   | VII        | 0.1        | 2.1         | 0.6         | H     |
| °61  | <i>Neolimnophila carteri</i> (TONN.)                                   | 1, 21, 101                                  | + | V, VI      | 0.1        | 6.4         | 1.9         | E     |



| 1   | 2   | 3  | 4 | 5          | 6          | 7           | 8           | 9     |
|-----|---|--|---|------------|------------|-------------|-------------|-------|
| °62 | <i>Crypteria limnophiloides</i> BERGR.                        | 1, 88, 101   | + | VIII, IX   | 0,2        | 6,4         | 1,9         | wP    |
| °63 | <i>Gonomyia</i> (G.) <i>dentata</i> DE MEIJ.                  | 2, 75, 101   | + | V-VIII     | 1,3        | 6,4         | 3,8         | E     |
| 64  | <i>Gonomyia</i> (G.) <i>lucidula</i> LACK.                    | 34   | + | VII        | 0,1        | 2,1         | 0,6         | E     |
| °65 | <i>Gonomyia</i> (G.) <i>simplex</i> TONN.                     | 22   |   | V          | 0,1        | 2,1         | 0,6         | E     |
| 66  | <i>Gonomyia</i> (G.) <i>tenella</i> (MG.)                     | 70, 105  | + | VI, VIII   | 0,1        | 4,3         | 1,3         | E     |
| 67  | <i>Rhabdomastix</i> ( <i>Sacandaga</i> ) <i>laeta</i> (LOEW)  | 55   |   | VII        | 0,1        | 2,1         | 0,6         | Ptb   |
| °68 | <i>Lipsothrix remota</i> (WALK.)                              | 3, 26, 65  | + | V-VII      | 0,1        | 6,4         | 1,9         | E     |
| 69  | <i>Cheilotrichia</i> (Ch.) <i>imbuta</i> (WIED.)              | 3, 6, 8, 9, 23, 42, 58, 64, 65, 71                       | + | V-VIII     | 1,4        | 21,3        | 7,6         | aP    |
| °70 | <i>Cheilotrichia</i> ( <i>Empeda</i> ) <i>affinis</i> (LACK.) | 3, 101   | + | IX         | 0,2        | 4,3         | 1,3         | E, bm |
| 71  | <i>Cheilotrichia</i> (E.) <i>cinerascens</i> (MG.)            | 1, 3, 23, 26, 37, 39, 40, 58, 65, 88, 101, 103, 105      | + | IV-VIII    | <u>4,2</u> | <u>27,7</u> | <u>11,5</u> | EmA   |
| 72  | <i>Gonempeda flava</i> (SCHUMM.)                              | 9, 14, 23, 26, 34, 64, 65, 76                            | + | VI-VII     | 1,7        | 17,0        | 5,1         | E     |
| 73  | <i>Symplecta hybrida</i> (MG.)                                | 2, 3, 63-65  | + | IV-V, VIII | 0,2        | 10,6        | 3,2         | H     |
| 74  | <i>Symplecta stictica</i> (MG.)                               | 27   |   | VII        | 0,1        | 2,1         | 0,6         | H     |
| 75  | <i>Erioptera</i> (E.) <i>divisa</i> WALK.                     | 1, 3, 105  | + | V, VI      | 0,6        | 6,4         | 2,6         | wP    |
| 76  | <i>Erioptera</i> (E.) <i>fuscipennis</i> MG.                  | 2, 3, 8, 23, 26, 82, 88, 101                             | + | V-VII, IX  | 1,9        | 17,0        | 5,7         | E     |
| 77  | <i>Erioptera</i> (E.) <i>fusculenta</i> EDW.                  | 3, 8, 23, 64, 99   |   | V-VIII     | 1,2        | 10,6        | 3,8         | EmA   |
| 78  | <i>Erioptera</i> (E.) <i>gemina</i> TJED.                     | 8, 26, 64, 71  |   | VI-VIII    | 1,4        | 8,5         | 2,6         | EmA   |
| 79  | <i>Erioptera</i> (E.) <i>griseipennis</i> (MG.)               | 2, 3, 6, 9, 14, 22, 23, 27, 64, 76, 82, 99               |   | V-VII      | <u>4,8</u> | <u>25,5</u> | <u>11,5</u> | E     |
| 80  | <i>Erioptera</i> (E.) <i>lutea</i> Mc.                        | 1-3, 12, 21-23, 39, 42, 63-65, 71, 82, 88, 101, 102, 105 | + | IV-X       | 3,1        | <u>38,3</u> | <u>22,9</u> | tP    |
| 81  | <i>Erioptera</i> (E.) <i>sordida</i> ZETT.                    | 3  |   | V          | 0,1        | 2,1         | 0,6         | aP    |

| 1   | 2  | 3  | 4 | 5        | 6   | 7           | 8           | 9      |
|-----|--|--|---|----------|-----|-------------|-------------|--------|
| 82  | <i>Eriocnopa trivialis</i> (MG.)   | 2, 3, 22, 23, 32, 64, 78, 82, 101                    | + | V-VI, IX | 3,3 | 19,2        | <u>10,8</u> | wP     |
| 83  | <i>Ilisia (I.) maculata</i> (MG.)  | 2, 22, 23, 26, 27, 42, 63, 71                        | + | V-IX     | 1,2 | 17,0        | 8,3         | wP     |
| 84  | <i>Hoplolabis (Parilisia) spinosa</i> (NIELS.)                           | 99   |   | V        | 0,1 | 2,1         | 0,6         | ?mE    |
| 85  | <i>Hoplolabis (P.) vicina</i> (TONN.)                                    | 14, 42, 104  | + | VI-VIII  | 0,2 | 6,4         | 1,9         | wP     |
| 86  | <i>Ormosia (Rhypholophus) haemorrhoidalis</i> (ZETT.)                    | 3, 23, 40, 63-65, 88, 89, 101                        | + | IX-X     | 2,1 | 19,2        | 6,4         | tP     |
| °87 | <i>Ormosia (Rh.) varia</i> (MG.)   | 63, 101  | + | IX       | 0,1 | 4,3         | 1,3         | E      |
| 88  | <i>Ormosia (O.) depilata</i> EDW.  | 2, 3, 21, 22, 39, 63, 88, 102                        | + | V-VI     | 1,2 | 17,0        | 7,0         | E      |
| 89  | <i>Ormosia (O.) hederæ</i> (CURT.)                                       | 3, 23  |   | V, VIII  | 0,1 | 4,3         | 1,3         | wP     |
| 90  | <i>Ormosia (O.) lineata</i> (MG.)  | 64, 101  | + | IV, V    | 0,3 | 4,3         | 2,6         | E      |
| °91 | <i>Ormosia (O.) pseudosimilis</i> (LDSTR.)                               | 1, 2, 14, 37, 39, 101, 102                           | + | V-VI     | 2,2 | 14,9        | 6,4         | E, bm  |
| °92 | <i>Ormosia (O.) staegeriana</i> ALEX.<br>[=O.(O.) <i>similis</i> STAEG.] | 1  | + | VI       | 0,1 | 2,1         | 0,6         | E, ?bm |
| °93 | <i>Tasiocera (Dasymolophilus) jenkinsoni</i> FREEM.                      | 39   |   | VII      | 0,1 | 2,1         | 0,6         | ?E*    |
| °94 | <i>Tasiocera (D.) murina</i> (MG.)                                       | 3, 39  | + | V, VI    | 0,5 | 4,3         | 1,9         | wP     |
| °95 | <i>Molophilus appendiculatus</i> (STAEG.)                                | 3, 23, 39, 42, 63-65                                 | + | V-VIII   | 1,7 | 14,9        | 8,3         | EmA    |
| 96  | <i>Molophilus ater</i> (MG.)   | 1, 2, 22, 32, 40, 42                                 | + | V-VI     | 2,1 | 12,8        | 5,7         | E      |
| °97 | <i>Molophilus cinereifrons</i> DE MEIJ.                                  | 1, 22, 63, 77, 94                                    | + | V-VII    | 0,3 | 10,6        | 3,8         | E      |
| 98  | <i>Molophilus flavus</i> GOETGH.   | 2, 3, 5, 12, 39, 63, 64, 77, 89, 102                 | + | V-VIII   | 0,7 | 21,3        | 6,4         | E      |
| 99  | <i>Molophilus griseus</i> (MG.)  | 2, 3, 23, 64, 102                                    |   | V-IX     | 0,4 | 10,6        | 3,8         | wP     |
| 100 | <i>Molophilus medius</i> DE MEIJ.  | 1, 5, 8, 22, 23, 26, 40, 42, 58, 63, 65, 71, 75, 102 | + | V-VIII   | 3,5 | <u>29,8</u> | <u>10,8</u> | E      |
| 101 | <i>Molophilus niger</i> GOETGH.  | 99   |   | V        | 0,1 | 2,1         | 0,6         | E      |

| 1                | 2                                   | 3                                   | 4 | 5        | 6   | 7    | 8   | 9  |
|------------------|-------------------------------------|-------------------------------------|---|----------|-----|------|-----|----|
| 102              | <i>Molophilus obscurus</i> (MG.)    | 3, 8, 22, 23, 64, 82                |   | V, VII   | 0,9 | 12,8 | 4,5 | wP |
| 103              | <i>Molophilus ochraceus</i> (MG.)   | 1, 3, 8, 9, 23, 26, 42, 64, 65, 99  | + | VI-IX    | 1,1 | 21,3 | 8,9 | E  |
| 104              | <i>Molophilus ochrescens</i> EDW.   | 3, 23, 42, 58, 63, 64, 93           | + | VII-VIII | 1,6 | 14,9 | 7,0 | mE |
| 105              | <i>Molophilus propinquus</i> (EGG.) | 2, 3, 8, 22, 23, 55, 65, 71, 72, 99 |   | V-VIII   | 1,5 | 21,3 | 8,9 | tP |
| <sup>p</sup> 106 | <i>Molophilus undulatus</i> TONN.   | 40                                  | + | IX       | 0,1 | 2,1  | 0,6 | wP |

Explanations of symbols used in the table:

- o - new species for the fauna of the Świętokrzyskie Mts
- oo - new species for the Polish fauna
- NP - species recorded in the area of the Świętokrzyski National Park
- D - species dominance in the material
- C - species frequency in the stations
- F - species frequency in the samples
- ZG - zoogeographical classification
- aP - amphipalaearctic species
- bm - boreal-montane species
- E - European species
- EmA - European-midasiatic species
- H - holarctic species
- HbmP - holarctic species, boreal-montane in Palearctica
- HtP - holarctic species, transboreal in Palearctica
- HwP - holarctic species, western palaearctic in Palearctica
- m - montane species
- mE - Milde European species
- Ptb - transboreal species in Palearctica
- tP - transpalaearctic species
- wP - western palaearctic species
- \* - in Europe known only in Great Britain, Czechoslovakia, South Germany and Yugoslavia (STARÝ 1971; MENDEL 1978; SAVČENKO 1982).

The most common and/or abundant species occurring in the area of Łysogóry Chain are underlined in the table. In the material from the Łysogóry Chain two species had the highest dominance: *Dicranomyia* (*D.*) *modesta* and *Phylidorea* (*Ph.*) *squalens*. Because C- and F-values are also high in the case *D.* (*D.*) *modesta*, this species may be considered the common and abundant in the study area. On the other hand *Ph.* (*Ph.*) *squalens* was collected sporadically in several stations only, while the very high dominance of this species was caused only by a single rich sampling carried out in the "Czarny Las" Reserve (station 42) in May 1985 during the mass flight of adult specimens from marshes situated at the banks of the Czarna Woda River. Similar results were obtained in the course of investigations carried out in the valley of the Lubrzanka River (WIEDEŃSKA 1986).

Habitat preferences of particular species allowed to distinguish in the present material four groups of crane-fly species.

In open areas outside of the forest border the following species were encountered more frequently and in higher abundance: *Limonia* (*L.*) *macrostigma*, *Dicranomyia* (*D.*) *chorea*, *D.* (*D.*) *modesta*, *Rhipida duplicata*, *Pedicia* (*C.*) *zernyi*, *Dicranota* (*D.*) *bimaculata*, *Pseudolimnophila lucorum*, *P. sepium*, *Eloeophila maculata*, *E. trimaculata*, *Neolimnomyia* (*B.*) *nemoralis*, *Pilaria discicollis*, *Gonomyia* (*G.*) *dentata*, *Gonempeda flava*, *Erioptera* (*E.*) *fuscipennis*, *E.* (*E.*) *fusculenta*, *E.* (*E.*) *gemina*, *E.* (*E.*) *griseipennis*, *Erioconopa trivialis*, *Molophilus griseus*, *M. medius*, *M. obscurus*, *M. ochrescens* and *M. propinquus*.

Forest areas were clearly preferred by crane-flies of the following species: *Limonia* (*L.*) *nubeculosa*, *Ula* (*U.*) *mollissima*, *Pedicia* (*C.*) *straminea*, *Tricyphona schummeli*, *Phylidorea* (*E.*) *phaeostigma*, *Neolimnophilacarteri*, *Crypteria limnophiloides* and *Ormosia* (*O.*) *pseudosimilis*.

Some species occurred in similar frequency and abundance in both types of habitats ("ubiquists"). These were: *Limonia* (*L.*) *flavipes*, *L.* (*L.*) *tripunctata*, *L.* (*M.*) *quadrinotata*, *Helius longirostris*, *Tricyphona immaculata*, *Limnophila* (*L.*) *punctata*, *Eloeophila submarmorata*, *Phylidorea*, (*E.*) *fulvonervosa*, *Cheilotrichia* (*E.*) *cinerascens*, *Erioptera* (*E.*) *lutea*, *Ilisia* (*I.*) *maculata*, *Ormosia* (*Rh.*) *haemorrhoidalis*, *Ormosia* (*O.*) *depilata*, *Molophilus appendiculatus*, *M. ater*, *M. flavus* and *M. ochraceus*.

The fourth group is composed of species which occurred only or almost exclusively in marshy areas. These were: *Idioptera fasciata*, *I. pulchella* and *Phylidorea* (*Ph.*) *squalens*.

The above grouping was done more or less arbitrarily. Only in the case of the fourth group the factor related to the development of preimaginal forms, namely the type of substrate in which the larvae live, was taken into consideration. This factor is undoubtedly one of the more important factors conditioning the occurrence of these insects in various areas. However, in the case of the present studies this factor could not be always investigated due to objective reasons and was considered only in two clearly distinguished large marshy areas. In contrast the distinguishing of a group of species preferring forests and of a group of species preferring non-forested areas as well as a third group of "ubiquists" cannot be, by now, interpreted.

It should be remembered that most of the samples were collected downstream

along rivers and streams, and many of the recorded species are crane-flies whose preimaginal stages live in water or in wet banks on the border between land and water. Therefore the possible zonal distribution of *Limoniidae* along the water-course could influence the groupings presented above.

It appeared that the more diversified fauna of *Limoniidae* was found in areas situated below the forest borderline. This information may be important for the nature protection services, by calling their attention to the fact how the protection is important also for areas lying in regions occurring in the closest vicinities of the preserves.

In areas situated below the forest borderline 88 species of *Limoniidae* were found, in those of forested areas – 63 species, whereas 49 species occurred in both types of habitat. 12 species were recorded only in forests, 33 species only in non-forested areas.

Marshy areas were represented only by two stations, hence it seems highly probable that the number of species recorded (29) is very incomplete. Only 6 species occurred exclusively in these stations, but except two species of the genus *Idioptera*, for which marshy areas and peatbogs are the most suitable habitats, the preferences of four other species are certainly not restricted and they inhabit also other habitats.

No differences between the *Limoniidae* fauna of similar habitats of southern and northern slopes of the Łysogóry Chain were observed.

## SUMMARY

In total, as a result of present investigations and those on *Limoniidae* of the Lubrzanka River valley (WIEDŃSKA 1986) the occurrence of 119 species of this family were recorded in the area of the Świętokrzyskie Mts.

The fauna of *Limoniidae* of the Świętokrzyskie Mts is represented by 52 European species, 9 or even 11 which have the boreal-montane range. 55 species have palearctic range, among which 23 are western palearctic species, 11 species have European-midasiatic range, 7 species are transboreal ones, 9 – amphipaleartic and 5 – transpaleartic. Only 12 species do occur also in Nearctica.

It is also worth to compare the fauna of *Limoniidae* of the Świętokrzyskie Mts with those of other Middle-European parts of similar physiographic character to that of the Świętokrzyskie Mts.

In the German part of "Mittelgebirge" MENDEL (1975) recorded the occurrence of 132 species of *Limoniidae*, 86 of which were common both to that area and to the Świętokrzyskie Mts. In one part of that area, namely the Rhön Mts, there were as much as 75% species common with those in the Świętokrzyskie Mts. However, I suppose that the list of species of that area (MENDEL gives only 52 species) is still incomplete and a higher level of peculiarity of the Rhön Mts will be proved in the course of further investigations.

Two other areas, the Jeseniki Mts in Czechoslovakia, which were investigated by STARÝ (1968), and Alpine Piedmont, which was studied by MENDEL (1977), are

situated at higher altitude than the Świętokrzyskie Mts. 85 species of *Limoniidae* were recorded in the Jeseniki Mts, 50 of which were species noted also in the Świętokrzyskie Mts. In an Alpine Piedmont area close to Allgäu 186 species were recorded, 86 of which occurred also in the Świętokrzyskie Mts.

Despite these considerable similarities some peculiarity of the fauna of *Limoniidae* of the Świętokrzyskie Mts may be observed. This is caused mainly by the lack in the Świętokrzyskie Mts of montane species and western and southern European species. Within the area of the Świętokrzyskie Mts there occur only two species whose ranges are described by SAVČENKO (1982) as western European or western Central-European. Out of 52 European species of *Limoniidae* of the Świętokrzyskie Mts the majority, i.e. about 78%, are species occurring in most area Europe or in north-western, northern and eastern Europe.

The above presented zoogeographic analysis is a rather general and rough one. However, a more detailed zoogeographic discussion on the fauna of *Limoniidae* of Świętokrzyskie Mts will be possible only after much better recognition of Palearctic and world limoniid fauna.

#### Rectification

Incorrect information concerning the species *Rhabdomastix (Sacandaga) parva* (SIEBKE) was included in Part I of my study on the family *Limoniidae* from the Świętokrzyskie Mts (WIEDEŃSKA 1986). This species was wrongly identified. The information should be: *Rhabdomastix (Sacandaga) subparva* STARÝ. Material: Leszczyń, 20 V 81, ♂.

This species was described in Moravia (STARÝ 1970) and is also known in Central Europe (MENDL 1977) and Ukraine (SAVČENKO 1982). It is a new species in the fauna of Poland.

I extend warm thanks to Dr. J. STARÝ for his valuable remarks on this problem.

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## STRESZCZENIE

[Tytuł: Sygaczowate (*Diptera, Limoniidae*) Gór Świętokrzyskich. Cz. II. *Limoniidae* Łysogór]

Materiały zbierane były w latach 1982–1985 w 47 stanowiskach usytuowanych przeważnie wzdłuż strumieni łysogórskich (rys. 1). Jest to część spośród stanowisk wytypowanych do badań hydrobiologicznych prowadzonych przez zespół Zakładu Bezkręgowców i Hydrobiologii Uniwersytetu Łódzkiego (PIECHOCKI 1986).

Zebrany materiał obejmuje 2149 imagines *Limoniidae*, chwypanych siatką entomologiczną o średnicy 40 cm. Kilka prób pochodzi z pułapki świetlnej (stanow. 105). Materiał został zakonserwowany w 75% alkoholu lub zatopiony w trwałych preparatach. Aby próby były porównywalne, pobierano je każdorazowo przez 30 minut.

Na terenie Łysogór stwierdzono występowanie 106 gatunków muchówek z rodziny *Limoniidae* (tab I), 67 spośród nich zostało już stwierdzone w Górach Świętokrzyskich (WIEDENSKA 1986), a 38 to gatunki nowe dla tego regionu; w tej ostatniej liczbie mieści się też 10 gatunków odnotowanych po raz pierwszy w faunie Polski.

Porównano również skład gatunkowy fauny *Limoniidae* na terenach zalesionych (17 stanowisk, 59 prób), na terenach położonych poza granicami lasu

(27 stanowisk, 80 prób) oraz na terenach bagiennych (2 stanowiska, 14 prób). Na obszarach położonych poniżej granicy lasu stwierdzono występowanie 87 gatunków *Limoniidae*, na terenach leśnych 63, przy czym 49 gatunków występowało w obu omawianych typach siedlisk. Wyłącznie w lasach schwytano 12 gatunków, wyłącznie na terenach nie zalesionych – 32. Trzecia grupa – obszary bagienne – reprezentowana jest tylko przez dwa stanowiska, wydaje się więc bardzo prawdopodobne, że liczba stwierdzonych tu gatunków (29) jest niekompletna. Wyłącznie w tych stanowiskach występowało 6 gatunków, ale poza dwoma z rodzaju *Idioptera* MACQ., dla których obszary bagienne i torfowiska są najbardziej typowymi siedliskami, cztery pozostałe żyją też w siedliskach o bardzo odmiennym charakterze.

Fakt, że łysogórska fauna *Limoniidae* jest bogatsza poza obszarami Świętokrzyskiego Parku Narodowego, może mieć znaczenie dla służb ochrony przyrody, zwracając uwagę, jak ważne znaczenie ma ochrona również terenów położonych w najbliższym sąsiedztwie rezerwatów, czyli tak zwanej otuliny.

Obfity materiał pozwolił również na poczynienie pewnych uwag o poszczególnych gatunkach. Na podstawie dominacji w materiale (D) oraz częstości występowania poszczególnych gatunków w stanowiskach (C) i próbach (F) wyodrębniono grupy gatunków występujących:

1. częściej i liczniej na terenach leśnych,
2. częściej i liczniej na terenach otwartych (bezleśnych),
3. w podobnej liczebności i podobnej liczbie stanowisk w obu typach siedlisk,
4. wyłącznie lub prawie wyłącznie na terenach bagiennych.

Podział stanowisk, którym zostały przypisane wymienione grupy gatunków, został dokonany w sposób arbitralny, ponieważ nie mogły być brane pod uwagę wszystkie czynniki środowiskowe; np. jedynie w odniesieniu do stanowisk położonych na dużych obszarach bagiennych został podkreślony jeden z najważniejszych czynników decydujących o rozmieszczeniu *Limoniidae*, mianowicie rodzaj podłoża, w którym rozwijają się stadia preimaginalne tych muchówek. Dlatego wszystkie podane w pracy wyniki obserwacji są jedynie stwierdzeniem faktów, natomiast nie jest możliwa dokładniejsza ich interpretacja.

Nie zaobserwowano różnic w składzie fauny *Limoniidae* między analogicznymi siedliskami południowych i północnych stoków Łysogór.

Dokonano również wstępnej analizy zoogeograficznej fauny *Limoniidae* Gór Świętokrzyskich. Wśród 119 gatunków stwierdzonych dotąd w Łysogórach oraz w dolinie Lubrzanki (WIEDEŃSKA 1986), 52 występują tylko w Europie, 55 ma szersze zasięgi palearktyczne, a 12 występuje w całej Holarktyce. W faunie *Limoniidae* Gór Świętokrzyskich prawie nie ma gatunków o zasięgu południowo- i zachodnioeuropejskim.