

ENTOMOFAUNA OF *HERACLEUM SOSNOWSKYI* MANDEN

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Abstract. In 1998 and 1999, the research on the contents of entomofauna settlement of *Heracleum Sosnowskyi* Manden was carried out at Mochełek, and in 1999 – at Minikowo near Bydgoszcz. Useful insects were the most abundant group in the tested habitats. Based on the results of the investigations, it can be concluded that only two species: blunt's flat-body (*Depressaria depressella* Hb.) and celery fly (*Phyllophylla heraclei* L.) may be of any importance in the fight against population of this plant.

Key words: *Heracleum Sosnowskyi*, entomofauna

I. INTRODUCTION

Heracleum Sosnowskyi, the origin of which is Caucasus, was imported as a potential fodder plant to many research institutions in Poland at the beginning of the seventies (Lutyńska 1980; Pasieka 1984).

At present the plant is a refractory weed. It is especially a disadvantageous element in permanent grasslands and in mixed crops of the grasses and leguminous crops, as well as on fallow lands (Stupnicka-Rodzinkiewicz and Klima 1996).

Heracleum Sosnowskyi is a perennial plant containing significant amounts of photosensitive coumarin compounds that make human skin sensitive to sunlight, particularly on hot days and cause sunburns and hard healing wounds.

Fighting against this invasive weed occurred to be very difficult and arduous. Chemical control of *Heracleum Sosnowskyi* Manden is not enough effective. Agricultural practices together with chemical methods limit expansion of the plant only for some period of time, and do not suppress the hazard completely.

Therefore, it is interesting to identify the entomofauna of *Heracleum Sosnowskyi* Manden as well as studying it according to its possible use for biological control of this weed. It was the aim of the undertaken research.

II. AREA AND METHOD OF THE RESEARCH

The research was carried out at the Testing Station at Mochełek, the Department of Agriculture of the University of Technology and Agriculture in Bydgoszcz and the Centre of Agricultural Advice at Minikowo near Bydgoszcz in 1998 and 1999.

At Mochełek, *Heracleum Sosnowskyi* grew along a fence and on the plantation of goats rue (*Galega orientalis* Lam.). It was surrounded by cereal crops and a mixture of clover with alfalfa and grass. At Minikowo, *Heracleum Sosnowskyi* bordered on a deciduous forest and a pasture.

No chemical treatments were done against *Heracleum Sosnowskyi* at both stations. The exception was *Heracleum Sosnowskyi* Manden growing among the plantation of goats rue at Mochełek.

In 1999, only once there was done a protective treatment with herbicide Roundup 360 L just before the goats rue germination.

At Mochełek, mechanical treatments were done. They consist of annual cutting of inflorescences to protect fruits against scattering. However, no treatments were done at Minikowo.

Insects started to be collected at the turn of April and May. Originally a collection was done in the seven-day-period and twice a week at the time of florescence. In both settlements the observations were performed on twenty plants of *Heracleum Sosnowskyi*.

The insects were caught by scooping and shaking off from inflorescences into the bolting-cloth bags, which were put on the inflorescences and then shaken.

In each place, ten plants were selected at random and a ratio of leaf blade damages was determined using an estimated method according to the following scale:

0⁰ – leaves with no damage

I⁰ – up to 10% of damaged leaves

II⁰ – from 11 to 25% of damaged leaf blade

III⁰ – from 26 to 50% of damaged leaf blade

IV⁰ – from 51 to 70% of damaged leaf blade

V⁰ – from 71 to 100% of damaged leaf blade

Furthermore, at the feeding time of blunt's flat-body (*Depressaria depressella* Hb.), cocoon shells formed by this insect were counted on inflorescences of 10 plants.

In laboratory, the collected material was classified and the insects were characterized quantitatively and qualitatively. Apart from dipterous insects, lepidopterans, and lacewings, the others were determined to families.

III. RESULTS AND DISCUSSION

The research on the contents of entomofauna of *Heracleum Sosnowskyi* was carried out at Mochełek in 1998 and 1999, and at Minikowo in 1999.

Generally, 5,661 insects were caught at Minikowo, and 3,059 insects – at Mochełek (Table) by scooping and shaking off from plants. The qualitative analysis of the collected material showed occurrence of insects representing 7 orders.

Beetles were the most abundant group of insects. Dipterous insects were less numerous. Homopterans, hymenopterans and hemipterans were the next numerous group. Lepidopterans and representatives of lacewings were caught in the fewest amounts in both settlements.

The caught beetles belonged to seven families. Rape blossom beetle (*Meligethes aeneus* F.) was represented the most often among them. At Mochełek it was 97.7% of all the beetles population and at Minikowo – 97.1%. Rape blossom beetles fed on full blown inflorescences. No flower buds damaged by this insect were observed. Undoubtedly, the beetles fed on pollen at that time.

At Mochełek, true bees – *Apidae* (honey bee and common carder bees) occurred in large numbers among *Hymenoptera* – they made 57.6% of all the collected material, chalcid wasps (*Chalcididae*) made 21.4% and bracon flies (*Braconidae*) – 11.4%. The others were in the range from 0.3 to 5.9%. However, at Minikowo the most numerous were bracon flies (*Braconidae*) – 43.4%, true bees (*Apidae*) – 26.3% and Chalcid wasps (*Chalcididae*) – 17.6%. The others were in the range from 0 to 8.6%.

Homopterans (*Homoptera*) made 6.96% of the total number of the insects caught at Mochełek and 7.81% at Minikowo. In this order, leafhoppers (*Jassidae*) were the most numerous group – at Mochełek 64.5%, and at Minikowo 74.5%. Aphids (*Aphididae*) made 23% and more at Minikowo and 33.5% at Mochełek. Froghoppers (*Cercopidae*), precisely a meadow froghopper (*Philaenus spumarius* L.) was in the range from 2.0-2.5%

Healybugs (*Pseudococcus* sp.) made a separate group and occurred on 16.7% of the tested plants only at Mochełek in the second decade of July in 1998. Generally, healybugs settled 22 leaves on the tested plants. Significantly more insects fed on the bottom side of the leaf blade than on the top one. Totally, from 116 to 302 specimens fed on the bottom side of the tested leaves. On the top side – only from 22 to 82 was estimated. In the following year, healybugs did not occur.

As far as hemipterans (*Heteroptera*) are concerned, plant bugs (*Miridae*) were a dominating family and made from 93.2 to 98.3% of all the insects caught in this group in both settlements.

Among the other insects occurring in large numbers, dipterous insects made 10.8% of the material collected at Mochełek and Minikowo – 18.57%.

Caterpillars of blunt's flat-body (*Depressaria depressella* Hb.) fed on inflorescences of *Heracleum Sosnowskyi* (Fig.). The largest number of damaged inflorescences (30.4%) was recorded at Minikowo in 1999 whereas at Mochełek 27% in 1998, and only 18.9% of florescences in 1999.

The ratio of the leaf blade damaged by a celery fly (*Philophylla heraclei* L.) belonging to the leaf miners family (*Agromyzidae*) that caused mines was determined by an estimated method according to the presented scale. Damages made by the insect were noticed on all tested plants. The precise analysis of the tested leaves showed that damages were only up to 10% (I⁰ acc. to the scale).

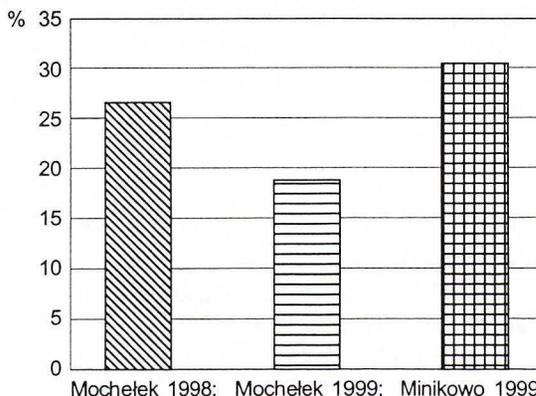


Fig. Damaged inflorescences by caterpillars of blunt's flat-body (*Depressaria depressella* Hb.) in %

Table

Abundance of entomofauna in *Heracleum Sosnowskyi* Manden cultures

Taxonomic Unit	Mochelek		Minikowo	
	total abundance	%	total abundance	%
<i>Hymenoptera</i>	323	5.70	221	7.22
<i>Formicidae</i>	11	0.19	9	0.29
<i>Apidae</i>	186	3.28	58	1.90
<i>Chalcididae</i>	69	1.22	39	1.27
<i>Ichneumonidae</i>	19	0.34	19	0.62
<i>Braconidae</i>	37	0.65	96	3.14
<i>Vespidae</i>	1	0.02	0	0
<i>Diptera</i>	617	10.89	568	18.57
<i>Neuroptera</i>	5	0.09	6	0.20
<i>Chrysopidae</i>	5	0.09	6	0.20
<i>Coleoptera</i>	4,031	71.20	1,807	59.07
<i>Staphylinidae</i>	55	0.97	5	0.16
<i>Cantharidae</i>	6	0.10	12	0.39
<i>Nitidulidae</i>	3,941	69.62	1,755	57.38
<i>Coccinellidae</i>	26	0.46	16	0.52
<i>Curculionidae</i>	3	0.05	10	0.33
<i>Scarabaeidae</i>	0	0	5	0.16
<i>Chrysomelidae</i>	0	0	4	0.13
<i>Homoptera</i>	394	6.96	239	7.81
<i>Cercopidae</i>	8	0.14	6	0.20
<i>Jassidae</i>	254	4.49	178	5.82
<i>Aphididae</i>	132	2.33	55	1.79
<i>Heteroptera</i>	242	4.26	191	6.24
<i>Pentatomidae</i>	1	0.02	8	0.26
<i>Nabidae</i>	3	0.05	5	0.16
<i>Miridae</i>	238	4.19	178	5.82
<i>Lepidoptera</i>	49	0.90	27	0.89
Total	5,661		3,059	

The data concern only the plants at Mochelek in the two years of experiment and at Minikowo in 1999.

In 1998 and 1999 *Tetranychidae*, spiders and fungal pathogens also occurred on *Heracleum Sosnowskyi* in both places.

There is little information about occurrence of different insects on *Heracleum Sosnowskyi* Manden. Lutyńska (1980) informs about occurrence of celery fly (*Philophylla heraclei* L.) and aphids at Nidzica near Czorsztyn and Grodkowice near Cracow. The occurrence of powdery mildew (*Erysiphe* sp.) was also noted.

More studies were carried out by Jurek at these places in 1980-1985 (1989, 1990). Apart from the insects mentioned by Lutyńska, he found out the occurrence of: blunt's flat-body (*Depressaria depressella* Hb.), leaf miners (*Agromyzidae*), *Halticineae*, meadow froghopper (*Philaenus spumarius* L.), leafhoppers (*Jassidae*), grasshopper whitefly (*Trialeurodes vaporarium*), rape blossom beetle (*Meligethes aeneus* F.), and among forage mites (*Acaridae*) – *Tetranychus*.

In Jurek's publication (1989), *Heracleum Sosnowskyi* was still referred to as „a perspective fodder plant of high exuberant growth”. For that reason, some wounds made by insects were treated as economic destructiveness.

Summarizing his observations, Jurek (1990) claims that the seed yield of *Heracleum Sosnowskyi* may be considerably limited by: aphids, *Lygus* sp., powdery mildew and also blunt's flat-body. Most insects mentioned by the author occurred at Mochełek and Minikowo.

Using insects or other organisms against weeds has been practised for a long time. There are many examples of successful biological control. This method limited to a large extent the occurrence of weeds like: *Opuntia* spp. (Coble 1995; 1996) or *Salvinia* ssp. However, the strategy of weed killing requires the knowledge of biology, ecology and the dynamics of its population (Mortimer 1987; Bhowmik 1993; Kropf 1996) as well as its fertility (Norris 1996).

Boczek (1996), in his paper concerning the state and prospects of biological control of weeds, informs that species attacking generative organs are particularly required for introduction since seed production is a key component of a plant life cycle.

Summarizing the presented results, it should be stated that useful insects were the most numerous group in the tested settlements. The insects include large numbers of true bees (*Apidae*) and parasitoids which were seen on *Heracleum Sosnowskyi*. Based on the analysis of the research, it can be concluded that only two pests (blunt's flat-body (*Depressaria depressella* Hb.) and celery fly (*Philophylla heraclei* L.) may be of any importance as far as biological control of the population of the plant is concerned. However, it may be difficult to use them considering numerous species of parasitoids.

Research on this subject will be continued in the succeeding years and the occurrence of blunt's flat-body will be particularly taken into consideration. After a short feeding, the larvae of this butterfly move to inflorescence, where they form cocoon shells and feed inside them. Flowers in the damaged umbels get russet and dry. Besides, the cocoon shells of blunt's flat-body's caterpillars on fructification make it difficult for seeds to scatter, which prevents spreading of the plant.

IV. LITERATURE

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ENTOMOFAUNA BARSZCZU SOSNOWSKIEGO *HERACLEUM SOSNOWSKYI* MANDEN

STRESZCZENIE

W latach 1998 i 1999 przeprowadzono badania w Stacji Badawczej Wydziału Rolniczego ATR w Mochełku i w Ośrodku Doradztwa Rolniczego w Minikowie k. Bydgoszczy.

Celem było poznanie entomofauny zasiedlającej barszcz sosnowskiego (*Heracleum Sosnowskyi* Manden) i przebadanie jej pod kątem możliwości ewentualnego wykorzystania w biologicznym jego zwalczaniu.

Najliczniejszą grupę w badanych siedliskach stanowiły owady pełniące pożyteczną rolę. Z analizy wyników można wnioskować, że tylko dwa szkodniki: płożek marchwiaczek (*Depressaria depressella* Hb.) i liściolubka selerowa (*Philophylla heraclei* L.) mogą odegrać rolę przy zwalczaniu populacji tej rośliny.