

PRESERVATION DEGREE OF WET BIOTOPES OF THE KOZŁOWIECKI
LANDSCAPE PARK BASED ON BIODIVERSITY OF LEAF BEETLES
(*COLEOPTERA: CHRYSOMELIDAE*)*

Radostaw Ścibior¹, Weronika Dunus²

¹Department of Zoology, Agricultural University
ul. Akademicka 13, 20-950 Lublin, Poland
e-mail: radoslaw.scibior@ ar.lublin.pl

² ul. Jana Kazimierza 4/2a, 22-100 Chełm, Poland

Abstract. In the years 2004-2005 chrysomelid beetles were collected at 7 stations marked out in plant communities of higher humidity (transitional and low bogs, alder swamps, moist meadows and rushes) in the Kozłowiecki Landscape Park area. The chrysomelids occurred most numerously in rush communities (33) and less numerously in transitional/low bogs, moist meadows (23 and 20, respectively) and alder swamps (15). The chrysomelid communities were dominated by hydro-, higr-, and mesohigrophilous species, which are bio-indicators of the preservation degree of these habitats. The highest share of those species was found in rushes (66.67%), lower transitional/low bogs and alder swamps (47.83 and 46.67%, respectively), and the lowest moist meadows (40%). They also reached high values on the fidelity index with relation to a definite kind of plant community. Wet biotopes of the park are also the refuge for boreal species like: *Chrysomela cuprea* (collected in 2005), *Hydrothassa marginella*, *Galerucella grisescens* and *Phyllotreta flexuosa*. The occurrence of those stenotopic species emphasized the high preservation degree of wet biotopes of the Kozłowiecki Landscape Park, and consequently confirmed the presence of favourable conditions for their development in the investigated area.

Key words: leaf beetles, *Chrysomelidae*, plant communities, Kozłowiecki Landscape Park

INTRODUCTION

Many chrysomelid beetles among those found in Poland can be considered indicator species of the habitats in which they occur. This is particularly visible in the case of beetles populating xerothermic and wet plant associations. The chry-

* The paper was presented and published in the frame of activity of the Centre of Excellence AGROPHYSICS – Contract No.: QLAM-2001-00428 sponsored by EU within the 5FP.

somelid communities often embrace stenotopic species which are eliminated first from the habitat when changes, both natural and anthropogenic, take place.

Experiments using species from the chrysomelid family or whole leaf-beetle communities as bio-indicators have already been conducted in Poland [8,9,10] and in Germany [4].

The aim of this investigation was an attempt to estimate the wet biotopes quality of the Kozłowiecki Landscape Park, based on the biodiversity of the chrysomelid communities and the presence of hydro-, higo- and meso-higrophilous species of beetles in plant associations. They are often stenotopes, preferring only specified biotic and abiotic values of wet biotopes.

RESEARCH AREA

The Kozłowiecki Landscape Park was established in 1990 to protect the biggest forest complex between Lublin and Lubartów as well as the associated peat bogs and ponds with character approximating the natural landscape. The park area is 6121 ha and the area of its lag is 7431 ha. Over 90% of the park contains forests, ca 6% – meadows and pastures, ca 2% – fields and ca 0.6% – ponds and rivers [3].

The chrysomelids fauna of the Park has not been hitherto investigated and the data about hydro-, higo- and mesohigrophilous species from the Mazovian Upland are scattered in the literature [1,2].

In the Park area the leaf-beetles were collected at 7 stations representing various plant associations in four types of communities: alder swamps (stations 1-2, 5-6), transitional and low bogs (st. 1-2), moist meadows (st. 3) and rushes (st. 4-5, 7) (Fig. 1).

MATERIAL AND METHODS

The results given below are from investigations carried out in various forests and open plant communities of the Kozłowiecki Landscape Park in the years 2004-2005.

The chrysomelid material which formed the basis for the present paper totalled 1822 individuals in the imago stage representing 58 species. All of them were found in the year 2004 in the studied wet biotopes of the Park.

The only method of collecting the chrysomelids feeding on leaves of bushes and trees (in alder swamp associations – *Ribeso nigri-Alnetum*, *Salicetum pentandro-cinereae*) was catching them in the entomological umbrella (5 trees or bushes of the same species on the research station). From herbaceous plants in transitional and low bogs, moist meadows or rush communities, insects were collected using the sweep-net. 100 sweeps (4×25) were required to make one sample.

Quantitative investigations were conducted regularly once each month, from April 2004 through September 2004, at 7 permanent stations (Fig. 1).

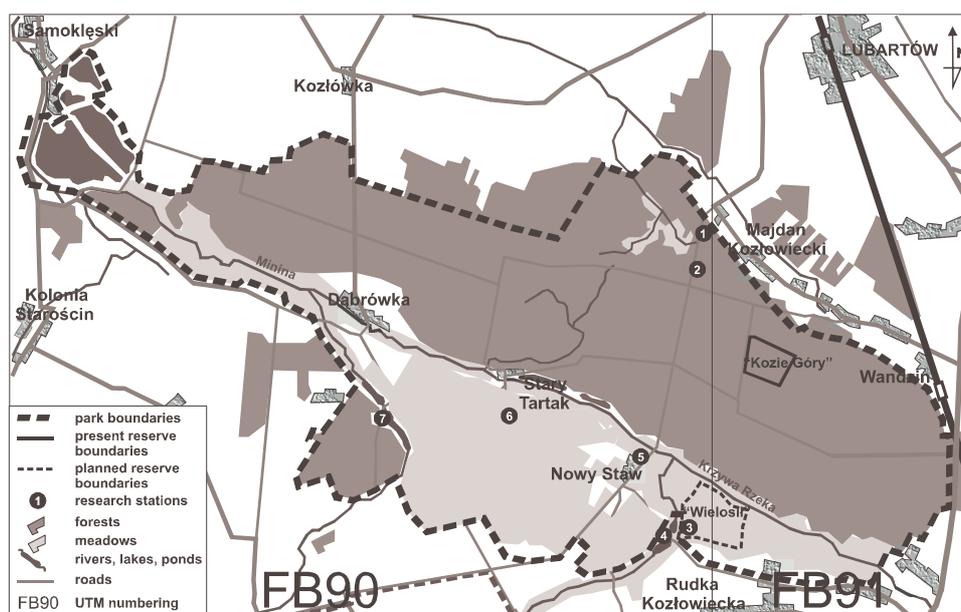


Fig. 1. Study area – The Kozłowiecki Landscape Park – distribution of stations
 1. Majdan Kozłowiecki (sec. 75), 2. Majdan Kozłowiecki (sec. 103, 105), 3. Rudka Kozłowiecka – “Wielosil” planned reserve, 4. Rudka Kozłowiecka – “Wzory” ponds, 5. Nowy Staw, 6. Stary Tartak, 7. Dąbrówka – “Stróżek” pond

In the quantitative analysis, the structure of dominance (D), Simpson's species richness index (d) of investigated chrysomelid communities [7], and the fidelity index of the species assemblages (W) were calculated. In order to define the species dominance structure of chrysomelids in each plant community, the following scale was used: eudominants (D_5 – >10%), dominants (D_4 – 5.01-10%), subdominants (D_3 – 2.01-5%), recedents (D_2 – 1-2%) and subrecedents (D_1 – <1%).

RESULTS AND DISCUSSION

32 composed hydrophiles, higrophiles and mesohigrophiles (55.17%) were found among the species collected in wet habitats of the park. The hydrophiles belonged mainly to *Donaciinae* and only a few species belonged to *Galerucinae* subfamilies [5,6]. The subfamily *Galerucinae* and some representatives of *Donaciinae*, *Cryptocephalinae*, *Chrysomelinae* and *Alticinae* were the majority of higo- and mesohigrophilous species.

In the investigated area the chrysomelids occurred most numerous in the transitional and low bog communities (1204 individuals – 66.08%), less numerous in rushes (315 indiv. – 17.29%) and alder swamps (244 indiv. – 13.39%), and less so in moist meadows (59 indiv. – 3.29%).

The chrysomelid community found in transitional and low bogs numbered 23 species. Of that group, 11 were hydro-, higo- or mesohigrophilous species (47.83%). Those bio-indicators of wet biotopes are given below in bold.

The structure of dominance in herbaceous plant layers was as follows – eu-dominants (D₅): ***Aphthona nonstriata*** (80.23%), ***Galerucella grisescens*** (15.94%); dominants (D₄): none; subdominants (D₃): none; recedents (D₂): none; subrecedents (D₁): *Phyllotreta vittula* (0.58%), *Oulema gallaeciana* (0.49%), ***Lythraia salicariae*** (0.33%), *Oulema melanopus*, ***Linnaeidea aenea***, *Phyllotreta nemorum* (all of them – 0.24%), ***Cryptocephalus parvulus***, *Gonioctena quinquepunctata*, ***Agelastica alni***, *Chaetocnema laevicollis*, ***Cassida viridis*** (0.16%), ***Prasocuris phellandrii***, ***Plagioderia versicolora***, ***Lochmaea capreae***, *Phyllotreta atra*, *Longitarsus lycopi*, *L. parvulus*, ***Crepidodera fulvicornis***, *Chaetocnema aridula*, *Ch. concinna*, *Cassida rubiginosa* (0.08%).

In transitional and low bog communities the characteristic species, occurring only in that type of habitat or similar, were mainly higo- and mesohigrophiles – ***Cryptocephalus parvulus***, *Longitarsus parvulus*, ***Lythraia salicariae*** (W=100%), ***Galerucella grisescens*** (W=92.7%), ***Aphthona nonstriata*** (W=81.79%), ***Lochmaea capreae*** (W=70%), ***Plagioderia versicolora*** (W=68.75%) and *Chaetocnema concinna* (W=50%).

Two species are closely related with *Lythrum salicaria* or *Lysimachia vulgaris* (*Primulaceae*) and with feeding on them – *Lythraia salicariae* and *Galerucella grisescens* [2].

The chrysomelid community of rushes numbered 33 species. Of that group, 22 were hydro-, higo- or mesohigrophilous species (66.67%), the highest percentage value of bio-indicator species of wet biotopes in the Park. They are given below in bold.

The structure of dominance in herbaceous plants layer was as follows – eu-dominants (D₅): ***Aphthona nonstriata*** (61.58%); dominants (D₄): ***Donacia semicuprea*** (6.34%); subdominants (D₃): ***Chrysolina polita*** (4.12%), ***Chrysolina herbacea*** (2.85%), ***Donacia thalassina***, ***Galerucella calmariensis***, ***Hippuriphila modeeri***, ***Cassida viridis*** (all of them – 2.22%); recedents (D₂): ***Gastrophysa viridula***, *Oulema gallaeciana* (1.9%), ***Agelastica alni*** (1.58%), ***Galerucella lineola*** (1.26%); subrecedents (D₁): *Phyllotreta vittula* (0.95%), *Oulema melanopus*, ***Hydrothassa marginella***, ***Linnaeidea aenea***, *Phyllotreta nemorum*, *Asiorestia ferruginea*, *A. transversa*, ***Dibolia occultans*** (0.63%), ***Plateumaris consimilis***, *Gastrophysa polygوني*, ***Prasocuris junci***, ***P. phellandrii***, *Chrysomela populi*, ***Galerucella tenella***,

Phyllotreta exclamationis, *Ph. striolata*, *Longitarsus lycopi*, *Altica lythri*, *Crepidodera aurata*, *Psylliodes dulcamare*, *Cassida rubiginosa* (0.31%).

All species collected in that type of plant community with a fidelity index value (W) over 50 percent were hydro- and higrophiles: *Donacia semicuprea*, *D. thalassina*, *Plateumaris consimilis*, *Prasocuris junci*, *Altica lythri*, *Chrysolina herbacea* (W = 100%), *Galerucella calvariensis* (W=87.5%), *Dibolia occultans* (W=66.67%), *Galerucella lineola* (W=66.67%), *Hippuriphila modeeri* (W = 58.33%), *Phyllotreta exclamationis* (W=50%) and *Psylliodes dulcamare* (W = 50%). In rush communities the highest number of characteristic species (12) was noted. Most of those species (8) were represented by widely distributed Palearctic or Euro-Siberian zoogeographical elements.

The leaf-beetles community of alder swamps numbered 15 species. In that group 7 were higo- or mesohigrophilous species (46.67%). They are given below in bold.

The dominance structure of chrysomelids in trees or shrub layers of that type of plant community was as follows: eudominants (D₅): *Gonioctena quinquepunctata* (30.74%), *Gonioctena viminalis* (15.98%), *Agelastica alni* (12.3%); dominants (D₄): *Linnaeidea aenea* (9.84%), *Crepidodera fulvicornis* (8.2%), *Galerucella grisescens* (6.15%), *Plagioderma versicolora*, *Crepidodera aurata* (5.33%); subdominants (D₃): *Lochmaea capreae* (2.87%); recedents (D₂): *Cryptocephalus octopunctatus*, *Asiolestia ferruginea*; subrecedents (D₁): *Phyllotreta atra*, *Aphthona euphorbiae*, *Chaetocnema hortensis* (0.41%).

In alder swamps the characteristic species were: *Plagioderma versicolora* (W = 81.25%), *Gonioctena viminalis* (W=78%), *Lochmaea capreae* (W=70%), *Agelastica alni* (W=62.5%), *Linnaeidea aenea* (W=54.5%) and *Aphthona euphorbiae* (W=50%).

All of the above species feed on alders, willows or poplars [1].

The chrysomelid community of moist meadows numbered 20 species. Of that group, 8 were higo- and mesohigrophilous species (40%), the lowest percentage value of bio-indicator species of wet biotopes in the Park. They are given below in bold.

The structure of dominance in herbaceous plants layer was as follows – eudominants (D₅): *Galerucella tenella* (33.89%), *Longitarsus melanocephalus* (11.86%); dominants (D₄): *Hydrothassa marginella* (6.77%), *Oulema melanopus* (6.77%), *Chrysolina fastuosa* (5.08%), *Asiolestia ferruginea* (5.08%); subdominants (D₃): *Oulema gallaeciana* (3.38%), *Longitarsus lycopi* (3.38%), *Asiolestia transversa* (3.38%), *Cassida flaveola* (3.38%); recedents (D₂): *Chrysolina polita* (1.69%), *Gastrophysa viridula* (1.69%), *Hydrothassa glabra* (1.69%), *Galeruca tanacetii* (1.69%), *Phyllotreta flexuosa* (1.69%), *Longitarsus nasturtii* (1.69%), *Chaetocnema hortensis* (1.69%), *Chaetocnema laevicollis* (1.69%), *Cassida denticollis* (1.69%), *Cassida nobilis* (1.69%); subrecedents (D₁): none.

In moist meadows the characteristic species were: *Phyllotreta flexuosa*, *Longitarsus lycopi*, *Cassida nobilis* (W=100%) and *Hydrothassa marginella* (W=50%). In this plant community the lowest number of characteristic species (2) was noted.

Among the 32 hydro-, higo-, and mesohigrophilous chrysomelid species recorded in the investigated wet plant communities in the park, 14 were described by Gräf and Koch as bio-indicators of wet habitats in Germany. They included: *Plateumaris consimilis*, *Chrysolina herbacea*, *Ch. polita*, *Prasocuris junci*, *Plagioderma versicolora*, *Linaeidea aenea*, *Galerucella calmariensis*, *G. tenella*, *Agelastica alni*, *Phyllotreta exclamationis*, *Hippuriphila modeeri*, *Crepidodera aurata*, *C. fulvicornis* and *Cassida vibex* [4]. A majority of them, however, showed the attributes of bio-indicator species of wet biotopes in all their distribution ranges.

In the investigated wet biotopes of the park the highest value of the species richness index was obtained for the chrysomelid community in the rushes (d=12.85), due primarily to the considerable differentiation of plant associations and large number of host plants. In addition to the characteristic species with high values of fidelity, species feeding on monocotyledones and dicotyledones also found favourable conditions for development in that community. Three remaining types of communities showed a lower value of the species richness index. For chrysomelid communities of moist meadows, transitional and low bogs, alder swamps, it amounted to 10.73, 7.14 and 5.88, respectively.

When comparing the results of the present investigation to those obtained in studies of the leaf-beetles of "Łasy Janowskie" Landscape Park [9,10], it was noted that the "Kozłówka" wet habitat chrysomelid communities have fewer species, or are poorer, than analogous communities such as "Łasy Janowskie". Nevertheless, they usually consist of the same higrophilous, bioindicator species, and they also attain similar values of dominance structure in analogous plant communities. The lesser number of chrysomelid species in wet biotopes of the Kozłowiecki Landscape Park is due to the smaller variety of host plants and reduced area of the plant communities rather than to a lesser degree of preservation.

CONCLUSIONS

1. The obtained results showed explicitly that a large number of hydro- and higrophilous species occurred in wet biotopes of the park. This fact justifies the protection of wet communities in their natural state. All of the observed plant communities of the park were highly natural, resulting in a high percentage of characteristic, often stenotopic species, and a small quantitative share of ubiquitous species of chrysomelids.

2. Wet biotopes are also the refuge for boreal species like: *Chrysomela cuprea* (collected in 2005), *Hydrothassa marginella*, *Galerucella grisescens* and *Phyllotreta*

flexuosa. Because of the lack of alpine and mountainous species in that area they can be considered the oldest of postglacial species presently occurring there.

REFERENCES

1. **Burakowski B., Mroczkowski M., Stefańska J.:** Beetles – *Coleoptera*, leaf beetles – *Chrysomelidae*, Vol I (in Polish). Katalog Polskiej Fauny, Warszawa, 23, 16, 1990.
2. **Burakowski B., Mroczkowski M., Stefańska J.:** Beetles – *Coleoptera*, leaf beetles – *Chrysomelidae*, Vol II (in Polish). Katalog Polskiej Fauny, Warszawa, 23, 22, 1991.
3. **Fijałkowski D.:** The Preservation of Nature and Natural Environment in Central-eastern Poland (in Polish). Wydawnictwo UMCS, Lublin, 1996.
4. **Gräf H., Koch K.:** Koleopterologische Untersuchungen zum Nachweis der Schutzwürdigkeit von Biotopen im Raume Nideggen/Nordeifel. Decheniana, 134: 91-148, 1981.
5. **Jäch M.A.:** Annotated check list of aquatic and riparian/littoral beetle families of the world. In: Water Beetles of China, Vol II (Eds M. A. Jäch, Ji L), 25-42, 1998.
6. **Jolivet P., Verma K.K.:** Biology of Leaf Beetles. Intercept Limited, Andover, Hampshire, UK, 2002.
7. **Odum E.P.:** The Elements of Ecology (in Polish). PWRiL, Warszawa, 1982.
8. **Raj A.:** The attempt of using zoindication methods in the geobotanical classification on the sample of the Karkonosze Mountains (in Polish). [In:] The valorization of the forest ecosystems by zoindication methods. VIth Symposium of the Forest Ecosystems Protection, Jedlnia, 220-232, 1997.
9. **Ścibior R.:** Biodiversity of chrysomelid beetles (*Coleoptera*, *Chrysomelidae*) of wet biotopes of the “Lasy Janowskie” Landscape Park. Acta Agrophysica, 1 (3), 88, 575-584, 2003.
10. **Ścibior R.:** Species diversity of the chrysomelid beetles (*Coleoptera*, *Chrysomelidae*) in marsh and alder swamp of the “Lasy Janowskie” Landscape Park. Teka Kom. Ochr. Kszt. Środ. Przyr., PAN, Lublin, 1, 267-273, 2004.

STOPIEŃ ZACHOWANIA BIOTOPÓW WILGOTNYCH KOZŁOWIECKIEGO
PARKU KRAJOBRAZOWEGO W OPARCIU O BIORÓŻNORODNOŚĆ
STONKOWATYCH (*COLEOPTERA: CHRYSOMELIDAE*)

*Radosław Ścibior*¹, *Weronika Dunus*²

¹ Katedra Zoologii, Akademia Rolnicza
20-950 Lublin, ul. Akademicka 13
e-mail: radoslaw.scibior@ ar.lublin.pl

² 22-100 Chełm, ul. Jana Kazimierza 4/2a

Streszczenie. W roku 2004 i 2005 na obszarze Kozłowieckiego Parku Krajobrazowego dokonano odłowów chrząszczy stonkowatych na 7 stanowiskach wyznaczonych w zbiorowiskach o wysokiej wilgotności (olsowych, szuwarowych, łąk wilgotnych oraz torfowisk przejściowych i niskich). Najwięcej gatunków zasiedlało zbiorowiska szuwarowe (33), mniej torfowiska przejściowe i niskie oraz wilgotne łąki (odpowiednio 23 i 20), a najmniej zbiorowiska olsowe (15). Zgrupowania stonkowatych badanych zbiorowisk były zdominowane przez gatunki hydro-, higo- i mezohigrofilne, które są biowskaźnikami stopnia zachowania tego typu siedlisk. Najwyższy udział tych gatunków cechował zbiorowiska szuwarowe (66,67%), niższy torfowiska przejściowe i niskie oraz olsy (odpo-

wiednio 47,83 i 46,67%), a najniższy wilgotne łąki (40%). Wykazywały one również wysoką wierność w stosunku do określonego typu zbiorowiska roślinnego. Zbiorowiska wilgotne parku stanowią refugium dla kilku stenotopowych gatunków borealnych, takich jak: *Chrysomela cuprea* (odłowiona w roku 2005), *Hydrothassa marginella*, *Galerucella grisescens* i *Phyllotreta flexuosa*. Ich obecność podkreśla znaczny stopień naturalności biotopów wilgotnych Kozłowieckiego Parku Krajobrazowego, i tym samym potwierdza występowanie korzystnych warunków dla ich rozwoju na badanym obszarze.

Słowa kluczowe: stonkowate, *Chrysomelidae*, zbiorowiska roślinne, Kozłowiecki Park Krajobrazowy