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THE CLICK-BEETLES (COLEOPTERA: ELATERIDAE) OF WET BIOTOPES OF THE POLESIE NATIONAL PARK

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Summary. As a result of studies on Elateridae of the wet plant communities of the Polesie National Park, 20 species of those beetles were recorded – 5 in swamp communities, 13 in lowland willow-poplar forests, 10 – in alders as well as in communities of wet meadows, peat bogs and fens analysed together. The species richness of the elaterofauna of the park was lower in comparison to the corresponding plant communities of the Lasy Janowskie Landscape Park, however, it was higher in relation to the wet habitats of the Kozłówka Landscape Park. The elaterofauna of the park was characterised by relatively high species diversity. Forest and meadow species – *Dalopius marginatus*, *Actenicerus siaelandicus*, *Athous haemorrhoidalis* – were dominating, as well as a eurytope – *Agrypnus murinus*. Ecological and zoogeographical analyses were also provided.

Key words: Elateridae, Polesie National Park, species diversity, zoogeography, wet plant communities

INTRODUCTION

Within the area of the Polesie National Park over 1500 animal species have been recorded so far [Radwan *et al*. 2002, Łętowski and Grądziel 2009]. An overwhelming majority are invertebrates, with over 1200 arthropod species among them. Despite the abundance of data on the fauna of the Polesie National Park, there is no information about the beetles from the family Elateridae. Worth mentioning is the fact that central-eastern and especially north-eastern Poland is poorly known in terms of inhabiting elaterofauna [Burakowski *et al*. 1985, Tarnawski 2000, Tarnawski and Buchholz 2008a, b].

To fill gradually this gap, in 2006 studies on click-beetles of some wet plant communities of the Polesie National Park were conducted. The aim of the research was to identify the species richness and the qualitative and quantitative structure of click-beetles in relation to the whole study area as well as particular communities.

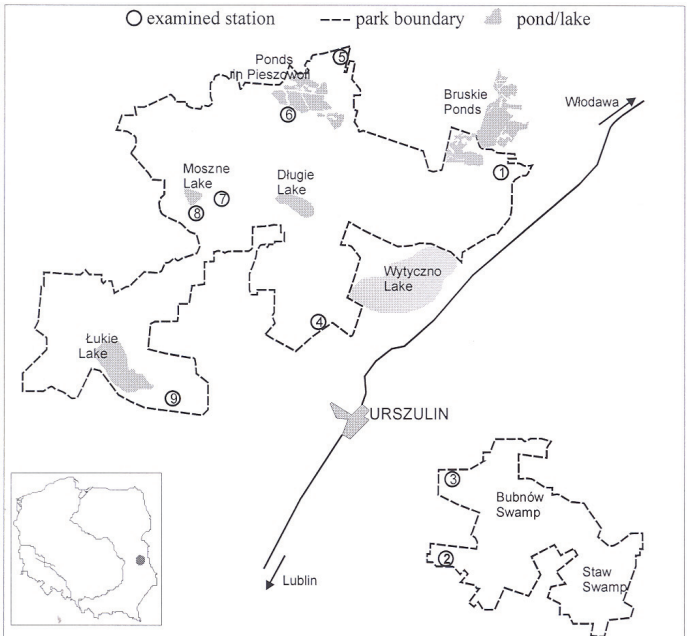
STUDY AREA AND METHODS

The Polesie National Park is situated in central-eastern Poland. It is entirely located in the western part of the Łęczyńsko-Włodawska Plain, which is a mesoregion of West Polesie [Kondracki 2000]. It is a park of aquatic and peat bog character. Together with its protection zone, it forms a part of the West Polesie Biosphere Reserve [Chmielewski 2009].

The studies on click-beetles of the wet biotopes of the park were conducted in five types of plant communities: lowland willow-poplar forests (*Salicetum triandro-viminalis* association), alders (*Salicetum pentandro-cinereae* and *Ribeso nigri-Alnetum* associations), swamp communities (*Phragmitetea* class) and wet meadows (*Molinietalia* class), as well as transitional peat bogs and fens (*Scheuchzerio-Caricetea nigrae* class) [Fijałkowski 2007].

Collecting of click-beetles was conducted regularly in the years 2006–2008, approximately twice a month, in the vegetation season from mid April till the middle of August at 9 study sites (see map). Beetles from herbaceous plants were

Map. Sketch of location of examined stations in the area Polesie National Park



Number and name of examined stations wich geografic coordinates:
1. Mietiułka ad Nowiny (swamp communities 51°27'44"N 23°14'10"E), 2. Bubnów Swamp ad Sęków (lowland willow-poplar forests 51°22'32"N 23°15'05"E, alder 51°22'34"N 23°15'35"E), 3. Bubnów Swamp ad Zastawie (transitional peat bogs and fens51°22'30"N 23°15'15"E), 4. Grobelka Michałowska (lowland willow-poplar forests 51°24'36"N 23°11'38"E, wet meadows 51°24'28"N 23°11'34"E), 5. Tabakówka (lowland willow-poplar forests, alder and swamp communities 51°22'30"N 23°15'15"E), 6. Pond Dziki ad Pieszowola (lowland willow-poplar forests 51°28'51"N 23°10'19"E, swamp communities 51°28'49"N 23°10'21"E), 7. Mszary ad Kol. Wola Wereszczyńska (alder, transitional peat bogs and wet meadows 51°27'26"N 23°08'05"E), 8. Moszne Lake (transitional peat bogs 51°27'19"N 23°07'11"E), 9. Spławy Swamp ad Zaucze Stare (transitional peat bogs 51°24'35"N 23°05'22"E)

gathered with the use of an entomological net. One quantitative sample consisted of 4 series of 25 sweeps. Click-beetles from trees and bushes were shaken down onto an entomological umbrella. For one quantitative sample the branches of five trees or bushes of the species occurring in a particular plant community (accessible from ground level) were shaken. The following biocenotic indices were used for the analysis of the collected material: dominance (D), constancy of occurrence in samples (C), ecological importance (Q), species diversity indices of Margalef (d) and Simpson (only for the whole material), as well as qualitative similarity (J) according to formula I of Jaccard [Kasprzak and Niedbała 1981, Szujecki 1983, Krebs 1996]. Ecological and zoogeographical analysis was also conducted.

RESULTS

20 species of click-beetles were found during the studies of the wet plant communities of the Polesie National Park. Species diversity index of Margalef (d) was 7.6. Equally high value was noted for the Simpson index (0.83). In the whole material the most numerous were *Agrypnus murinus* (D = 30.3%), *Dalopius marginatus* (D = 17.0%), *Actenicerus siaelandicus* (D = 16.0%) and *Athous haemorrhoidalis* (D = 12.9%). The values of dominance, constancy of occurrence in samples and ecological importance are given in Table 1.

The largest number of Elateridae species were noted in lowland willow-poplar forest communities (13). In alder communities as well as wet meadow, peat bog and fen ones – 10 species for each type of community. The lowest number of species – 5 – was found in swamp communities. The list of the species as well as D, C and Q values for every species are given in Table 1. Only in the case of swamp communities the above mentioned indices were not calculated due to the very small number of collected specimens. In spite of different number of species, the elaterofauna of lowland willow-poplar forest and alder communities had identical values of species diversity (d = 5.2). A slightly higher value of „d" was obtained for the Elateridae assemblage of wet meadows, peat bogs and fens – 5.7. The least diversified was the fauna of swamps (d = 4.0). While comparing the species composition of elaterofauna of the studied communities it was found that the highest qualitative similarity was between click-beetles of lowland willow-poplar forests and alders (J = 35.3%) as well as communities of wet meadows and peat bogs with fens (J = 35.3%). A little lower similarity was noted between the elaterofauna of alders and wet meadows and peat bogs with fens (J = 33.3%). The similarities of the Elateridae assemblages of the other communities ranged from 15.4 to 25.0%.

The analysis conducted with respect to habitat preferences showed that in the studied area the dominants included species characteristic for meadows and wet environments, and forest species met sometimes in environments outside forests (Fig. 1A). The number of species from both groups was similar, though

Table 1. List of species and biocenotic indices (in percentage) of Elateridae found in the examined humid communities of the Polesie National Park

Species	S	Overall			1			2			3			4
		D	C	Q	D	C	Q	D	C	Q	D	C	Q	L
Agrypnus murinus (L., 1758)	89	30.3	41.9	35.6	38.1	69.2	51,3	19.2	33.3	25.3	7.9	11.1	9.4	2
Cidnopus aeruginosus (Oliv., 1970)	3	1.0	4.8	2.2	1.5	11.5	4.2	-	-	-	-	-	-	-
Cidnopus pilosus (Leske, 1785)	1	0.3	1.6	0.7	0.5	3.8	1.4	-	-	-	-	-	-	-
Limonius minutus (L., 1758)	8	2.7	11.3	5.5	4.1	26.9	10.5	-	-	-	-	-	-	-
Hemicrepidius niger (L., 1758)	11	3.7	8.1	5.5	5.7	19.2	10.5	-	-	-	-	-	-	-
Athous haemorrhoidalis (Fabr., 1801)	38	12.9	19.4	15.8	17.5	30.8	23.2	5.8	25.0	12.0	2.6	5.6	3.8	-
Athous subfuscus (O.F. Müll., 1764)	4	1.4	6.5	3.0	0.5	3.8	1.4	5.8	25.0	12.0	-	-	-	-
Athous vittatus (Gmelin, 1790)	11	3.7	4.8	4.2	5.2	7.7	6.3	-	-	-	2.6	5.6	3.8	-
Actenicerus siaelandicus (O.F. Müll., 1764)	47	16.0	27.4	20.9	9.3	15.4	12.0	3.8	16.7	8.0	71.1	61.1	65.9	-
Prosternon tessellatum (L., 1758)	13	4.4	8.1	6.0	1.0	3.8	1.9	21.2	33.3	26.6	-	-	-	-
Selatosomus aeneus (L., 1758)	3	1.0	3.2	1.8	-	-	-	3.8	8.3	5.6	-	-	-	1
Ampedus pomonae (Steph., 1830)	2	0.7	3.2	1.5	-	-	-	1.9	8.3	3.9	2.6	5.6	3.8	-
Ampedus sanguinolentus (Schr., 1776)	3	1.0	3.2	1.8	-	-	-	5.8	16.6	9.8	-	-	-	-
Synaptus filiformis (Fabr., 1781)	1	0.3	1.6	1.0	-	-	-	-	-	-	-	-	-	1
Adrastus limbatus (Fabr., 1777)	1	0.3	1.6	1.0	-	-	-	-	-	-	2.6	5.6	3.8	-
Adrastus pallens (Fabr., 1792)	1	0.3	1.6	1.0	-	-	-	-	-	-	2.6	5.6	3.8	-
Adrastus rachifer (Fourcr., 1785)	2	0.7	3.2	1.5	0.5	3.8	1.4	-	-	-	2.6	5.6	3.8	-
Dalopius marginatus (L., 1758)	50	17.0	38.7	25.6	15.5	50.0	27.8	30.8	58.3	42,4	-	-	-	4
Agriotes lineatus (L., 1767)	4	1.4	6.5	3.0	0.5	3.8	1.4	-	-	-	2.6	5.6	3.8	2
Agriotes obscurus (L., 1758)	2	0.7	3.2	1.5	-	-	-	1.9	8.3	4.9	2.6	5.6	3.8	-

1 – lowland willow-poplar forests, 2 – alder, 3 – wet meadows and peat bogs, 4 – swamp communities, S – overall number of individuals of Elateridea in quantitative samples, D – dominance, C – constancy of occurrence in samples, Q – ecological significance, L – number of individuals of Elateridea in quantitative samples in swamp communities

the numbers of the second group were almost twice as high (Fig. 1B). In the wet communities of the Polesie National Park 4 species typical of wet areas were found. In the systematic order they were as follows: *Actenicerus siaelandicus*, *Ampedus pomonae*, *A. sanguinolentus* and *Synaptus filiformis*. Their quantitative share was 18.0%. *Actenicerus siaelandicus* (D = 16.0%, C = 27.4%) was the most

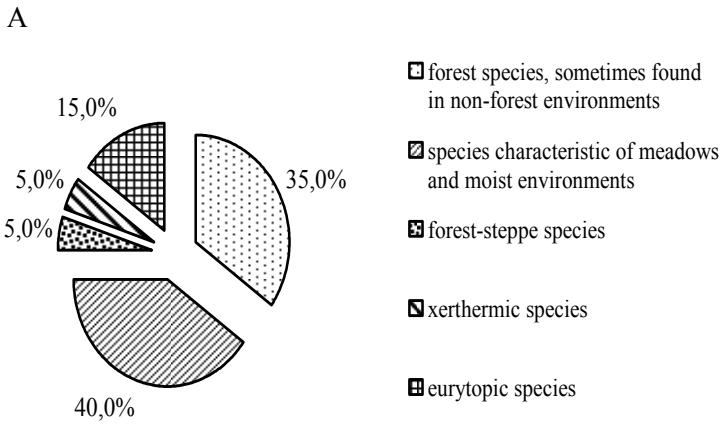


Fig. 1. Percentage of qualitative share of particular ecological groups distinguished on the basis of habitat preferences of the species development in click-beetles fauna of the Polesie National Park

numerously and often collected species. It was also found in almost every studied community. This species inhabits mainly open areas – marshy, peat bog and fen areas as well as meadows and forest glades [Burakowski *et. al*. 1985], therefore this species was recorded the most numerously in the wet meadows, peat bogs and fens in the park. The rest of hygrophilous species were collected more

rarely and in small numbers of individuals (Tab. 1). Taking into consideration the second criterion of the division of Elateridae – development microbiotope – it was concluded that 70.0% of the qualitative share of elaterofauna of the examined communities were species which undergo their development only in soil. The species which can develop in rotten wood were definitely less numerous (20.0%). Saproxylobiontic species and saproxylobiontic ones, developing sometimes in soil, were represented by – respectively – *Ampedus sanguinolentus* and *A. pomonae*.

The assemblage of click-beetles of the wet communities of the Polesie National Park was characterised by the highest share of wide-range zoogeographical elements (75.0%) and relatively low share of medium- and narrow-range elements (15.0% and 10.0%, respectively). The elements of wide range were also dominating in the elaterofauna of every community, and in alders and swamps were the only ones. Qualitative share of particular zoogeographical elements was as follows: holarctic 15.0%, Eurosiberian 30.0%, Euroasian 30.0%, European 15.0% and Ponto-Mediterranean 10.0%.

DISCUSSION

In the wet plant communities of the Polesie National Park 20 species of Elateridae were recorded. Since the click-beetles in the area of the park have not been studied so far, it is impossible to make any comparisons. One can only refer to the results of similar studies from two landscape parks and smaller areas in the country. Pawlęga [2003, 2004], on wet communities (lowland willow-poplar forests, alders, wet meadows, peat bogs and fens) of the Lasy Janowskie Landscape Park, identified 32 Elateridae species. This higher number of species can be explained by high diversity of the examined plant associations in particular types of communities, vaster study area and longer period of studies resulting in increasing opportunities for a richer collection of species. Qualitative similarity of the elaterofauna of both parks was 47.1%. Much poorer in comparison with the Polesie NP was the species composition (11 species) of click-beetles of wet habitats of the Kozłówka Landscape Park, which could be a result of the small area covered with the particular complexes of communities and poorer stage of their maintenance compared to the Polesie National Park [Pawlęga 2006]. Elaterocenoses of those parks were characterised by 34.8% qualitative similarity. A majority of the most numerous species in the wet communities of the Polesie NP was also dominating in the elaterofauna of the parks mentioned above [Pawlęga 2003, 2004, 2006].

The comparison between the elaterofauna of the studies communities of the Polesie National Park and click-beetles of corresponding communities of other areas is different. A higher number of species was found in the elaterofauna of particular wet communities of the Lasy Janowskie Landscape Park – 5 more in lowland willow-poplar forests, 7 more in wet meadows, peat bogs and fens, and 8 more in alders [Pawlęga 2003, 2004]. Fewer species than in the Polesie National Park were found by Pawlęga [2006] in the communities of alders as well

as wet meadows and fens of the Kozłówka Landscape Park – 8 and 7, respectively. Similar relations referring to the elaterofauna of the Poleski NP also concerned the species diversity of click-beetles of corresponding communities – higher values were noted for the elaterocenoses of the Lasy Janowskie Landscape Park, lower values – in the Kozłówka Landscape Park [Pawlęga 2003, 2004, 2006].

The number of click-beetle species in the studied communities of the park, similarities in the elaterofauna of those associations as well as the share of ecological groups were influenced by the type of community and, therefore, features of the habitat, their proximity and species bionomy. This resulted in the highest qualitative similarities of the elaterofauna of lowland willow-poplar forests, alders, wet meadows, peat bogs and fens (33.3–35.3%) as well as the large qualitative share species associated with meadows and wet habitats as well as forests.

In the elaterofauna of the wet communities of the Polesie National Park the dominants included wide-range zoogeographical elements, followed by medium- and narrow-range elements. The order of dominance of the particular range groups in the wet communities of the Lasy Janowskie and Kozłówka Landscape Parks were similar [Pawlęga 2003, 2004, 2006].

CONCLUSIONS

1. Species richness of Elateridae of the wet plant communities of the Polesie National Park comprised slightly over 15.0% of the national fauna of those beetles.
2. Elaterofauna of the wet plant communities of the park was characterised by high species richness.
3. The species composition of click-beetles of the wet plant communities of the park was influenced by habitat features of those plants, proximity to other types of habitats, as well as the presence and diversity of suitable development microbiotopes .
4. Elaterofauna of the wet plant communities of the Polesie National Park ranks at the medium level in terms of biocenotic features in comparison to the click-beetles of the corresponding habitats in protected areas of the Lublin Region.
5. Further systematic studies on the Elateridae fauna of the wet plant communities as well as their extension onto other forest and open habitats would enlarge the list of click-beetles known from this area as well as permit monitoring of environmental changes on the basis of those beetles.

REFERENCES

Burakowski B., Mroczkowski, M. Stefańska J., 1985. Beetles (Coleoptera), Buprestoidea, Elateroidea and Cantharoidea. The Catalogue of Polish Fauna (in Polish). Katalog Fauny Polski, Warszawa, 23, 10, 401 pp.

Chmielewski J.T., 2009. General characteristics of the „West Polesie" Biosphere Reserve, in: Chmielewski J.T. (ed.) The ecology of hydrogenic landscapes of Biosphere Reserve „Polesie Zachodnie" (in Polish). Wydawnictwo PZN, Warszawa, 9–19.

Fijałkowski D., 2007. The flora of Poleski National Park (in Polish). Lubelskie Towarzystwo Naukowe, Lublin, 336 pp.

Kondracki J., 2000. Regional geography of Poland (in Polish). Wydawnictwo Naukowe PWN, Warszawa, 441 pp.

Kasprzak K., Niedbała W., 1981. Biocenotic indices used in organizing and analysing data in quantitative studies, in: Górny M., Grüm L. (ed.) Methods in soil zoology (in Polish). Wydawnictwo Naukowe PWN, Warszawa, 397–416.

Krebs Ch.J., 1996. Ecology. Experimental analysis of distribution and numbers (in Polish). Wydawnictwo Naukowe PWN, Warszawa, 735 pp.

Łętowski J., Grądziel T., 2009. Natural environment of the Lublin Region. The world of animals (in Polish). Wydawnictwo Lubelskie Towarzystwo Naukowe, Lublin, 526 pp.

Pawlęga K., 2003. The click-beetles (Coleoptera: Elateridae) of wet habitat in the „Lasy Janowskie" Landscape Park. Acta Agrophysica, 1 (3), 88, 485–491.

Pawlega K., 2004. The click-beetles (Coleoptera: Elateridae) of the marshy meadow comunities in the „Lasy Janowskie" Landscape Park. Teka Kom. Ochr. Kszt. Środ. Przyr., OL PAN 1, 174–179.

Pawlęga K., 2006. Degree of maintenance of wet habitat in the Kozłowiecki Landscape Park and the occurring community of click-beetle (Coleoptera: Elateridae). Acta Agrophisica, **7** (2), 461–465.

Radwan S., Gliński J., Geodeci M., Rozmus M., 2002. Natural environment of Polesie – current state and changes (in Polish). Acta Agrophysica, Lublin, 66, 297.

Szujecki A., 1983. The ecology of forest insects (in Polish). Wydawnictwo Naukowe PWN, Warszawa, 604 pp.

Tarnawski D., 2000. Elateridae click-beetles (Insecta: Coleoptera), part I (general part and subfamilies: Agrypninae, Negastriinae, Diminae i Athoinae) (in Polish). Fauna Polski, Waszawa, 21, 413 pp.

Tarnawski D., Buchholz L., 2008a. Click-beetles – Elateridae. Introduction and subfamilies: Agrypninae, Negastriinae and Diminae. Identification keys for insects of Poland (in Polish). Toruń, nr series 172, part 19, vol. 34a, 125 pp.

Tarnawski D., Buchholz L., 2008b. Click-beetles – Elateridae. Subfamily: Athoine. Identification keys for insects of Poland (in Polish). Toruń, nr series 173, part 19, vol. 34b, 164 pp.

SPRĘŻYKOWATE (COLEOPTERA: ELATERIDAE) WILGOTNYCH BIOTOPÓW POLESKIEGO PARKU NARODOWEGO

Streszczenie. W wyniku badań nad Elateridae zbiorowisk wilgotnych Poleskiego Parku Narodowego stwierdzono 20 gatunków tych chrząszczy, w tym 5 w zbiorowiskach szuwarowych, 13 z łęgach i po 10 w olsach oraz łącznie zbiorowiskach wilgotnych łąk i torfowisk. Bogactwo gatunkowe elaterofauny parku było uboższe w porównaniu z odpowiednimi zbiorowiskami Parku Krajobrazowego Lasy Janowskie, większe zaś w odniesieniu do siedlisk wilgotnych Kozłowieckiego Parku Krajobrazowego. Elaterofauna parku cechowała się dość dużą różnorodnością gatunkową. Dominowały gatunki leśne i łąkowe – *Dalopius marginatus*, *Actenicerus siaelandicus*, *Athous haemorrhoidalis*, oraz eurytop *Agrypnus murinus*. Przeprowadzono również analizę ekologiczną i zoogeograficzną.

Słowa kluczowe: Elateridae, Poleski Park Narodowy, różnorodność gatunkowa, zoogeografia, zbiorowiska wilgotne