

Epigeic beetles (Coleoptera) of the Lake Świdwie nature reserve

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Abstract The data presented concern preliminary results of faunistic research carried out on the epigeic beetle fauna in the Lake Świdwie nature reserve, NW Poland (UTM VV53). Fourteen pitfall traps were placed in four different habitats in the reserve. A total of 957 specimens were collected belonging to 83 species and 16 families: Byrrhidae, Carabidae, Catopidae, Curculionidae, Dermestidae, Dryopidae, Elateridae, Eucinetidae, Hydrophilidae, Geotrupidae, Leiodidae, Linnichidae, Silphidae, Staphylinidae, Scarabaeidae, Tenebrionidae. Representatives of Staphylinidae, Hydrophilidae and Curculionidae were determinate to the family level only.

Chrząszcze epigeiczne (Coleoptera) rezerwatu przyrody „Jezioro Świdwie”

Słowa kluczowe Coleoptera, chrząszcze, fauna, skład gatunkowy, rezerwat przyrody „Jezioro Świdwie”

Streszczenie Przedstawiono wstępne wyniki badań faunistycznych chrząszczy epigeicznych w rezerwacie przyrody „Jezioro Świdwie” w Polsce północno-zachodniej (UTM VV53). Czternaście pułapek umieszczono w czterech różnych siedliskach. Odłowiono łącznie 957 okazów należących do 83 gatunków i 16 rodzin: Byrrhidae, Carabidae, Catopidae, Curculionidae, Dermestidae, Dryopidae, Elateridae, Eucinetidae, Hydrophilidae, Geotrupidae, Leiodidae, Linnichidae, Silphidae, Staphylinidae, Scarabaeidae, Tenebrionidae. Przedstawiciele Staphylinidae, Hydrophilidae i Curculionidae oznaczone tylko do poziomu rodziny.

Introduction

The protected areas of Western Pomerania are relatively well known, but only for selected families of beetles. A study by Wolender (2013) summarizes the results of many years of research on one of the largest families of epigeic beetles, the Carabidae. This paper, however, presents material from forest, grassland and dune habitats. The little information available on carabids of marshland is presented in a faunistic study of the fauna of the island of Wolin (Radawiec et al., 2015).

The best known are the carabids of wetlands (rushes and sedges) of the buffer zone of the Leon Wyczółkowski Cisy Staropolskie reserve (Stachowiak, Wilcz, 2001).

Other families of epigeic beetles in the wetlands of Western Pomerania have not been the subject of special studies. There has been only preliminary research on the fauna of the epigeic beetles of the Lake Szare nature reserve (Aleksandrowicz, Dąbkowski, 2007) and a study on the fauna of Gmina Tuczno, where Gutowski and Ruta (2004) recorded 38 and 49 beetle species in peat bogs and wet grassland. However, Gutowski and Ruta (2004) did not use pitfall traps.

Study area

Lake Świdwie is located in West Pomerania, about 20 km northwest of Szczecin, in the Puszcza Wkrzańska forest (E14°21'41" N53°33'50"). This shallow lake, together with the surrounding wetlands, is an ecologically valuable area, constituting one of the most important areas in the country on the bird migration path and under protection as the Świdwie nature reserve, which was added to the list of wetlands of international importance in 1978 under the Ramsar Convention.

At present, the reserve covers 891.28 ha, and the lake together with complexes of rushes covers a total area of 358 ha (Pienkowski, Kupiec, 2001). The surface area of the open water of the lake constitutes only 5.56% of its original area. The reserve area is fed by the Upper Gunica River and has a well-developed hydrographic network in the form of numerous natural watercourses and artificial canals (Kowalski, Bacieczko, 1993). The dominant communities having the most important role in the terrestrialization of the area are *Phragmitetum australis*, *Typhetum angustifolie*, *Typhetum latifolie* and *Sparganietum erecti* (Bacieczko, Kowalski, 1993). Dominant among grassland vegetation are *Arrhenatheretum elatioris*, *Deschampsietosum caespitosae*, *Potentillo Festucetum arundinaceae*, *Calamagrostietum epigeji*, *Urtico Calystegietum sepium*, *Caricetum gracilis* and *Caricetum ripariae* (Bacieczko, Kowalski, 1993). The forests in the reserve belong to the classes *Alnetea glutinosae* and *Vaccinio piceetea* (Kowalski, Bacieczko, 1993).

The study area was divided into 5 sites. The site numbers correspond to the locations marked in Figure 1.

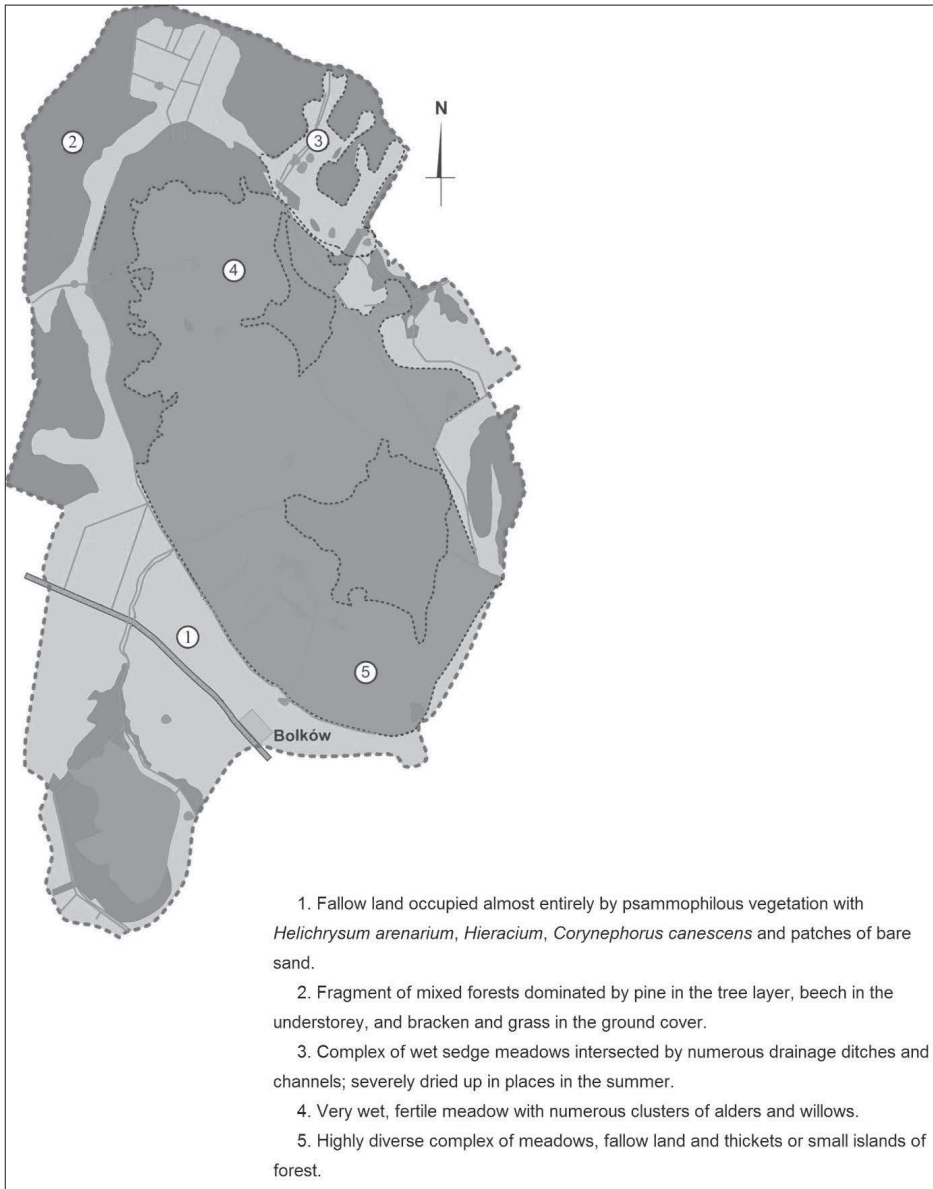


Figure 1. Map showing the distribution of the study sites in the Świdwie reserve

Research methods

Three research cycles were carried out in 2010 in the Świdwie nature reserve on 15–21 June, 10–15 July and 17–22 August.

Epigeic beetles were caught using 500 ml plastic cups. The upper rim of the cup, which was also the entrance to the trap, was 10 cm in diameter. The trap was placed in the ground so that the rim was level with the surface, to ensure that beetles penetrating the soil surface would fall in easily. To kill and preserve the insects entering the traps, they were filled with 50 ml of ethylene glycol (25%). The traps were arranged in a line, about 10 metres apart. Ten traps per habitat were set up in the line.

This is a standard, commonly used method in this type of research (Thiele, 1977).

The beetles were preserved in 70% ethyl alcohol and identified in the laboratory.

Works by Koch (1989, 1991) were used to determine species habitat preferences.

Similarity of species composition was evaluated using the Jaccard index and PAST software (Hammer et al., 2013).

Results and conclusions

During the study season a total of 957 epigeic beetles were caught, belonging to 16 families and 83 species (Table 1). Representatives of the families Staphylinidae, Hydrophilidae and Curculionidae were not identified to species.

There were 51 Carabidae species, 7 species each assigned to the Elateridae and Silphidae families, 3 each to Tenebrionidae and Leiodidae, 2 species each to Catopidae, Dryopidae, Scarabaeidae and Geotrupidae, and one each to Byrrhidae, Dermestidae, Eucinetidae and Limnichidae (Table 1).

Table 1. Species composition and number of specimens of selected epigeic beetle families caught in the Świdwie reserve

Familia and species	Fallow land	Fragment of mixed forest	Complex of wet sedge meadows	Very wet, fertile meadow	Highly diverse complex of meadows	Total
1	2	3	4	5	6	7
1. Byrrhidae (Latreille, 1806)						
<i>Cytilus sericeus</i> (Forster, 1771)	1					1
2. Carabidae (Latreille, 1802)						
<i>Abax parallelepipedus</i> (Piller et Mitterpacher, 1783)		4				4
<i>Agonum emarginatum</i> (Duftschmid, 1812)				7		7
<i>Agonum fuliginosum</i> (Panzer, 1809)			12	46	6	64
<i>Agonum viduum</i> (Panzer, 1796)				1		1
<i>Amara aenea</i> (Degeer, 1774)	1					1
<i>Amara bifrons</i> (Gyllenhal, 1810)	2					2

1	2	3	4	5	6	7
<i>Amara familiaris</i> (Duftschmid, 1812)					1	1
<i>Amara littorea</i> (Thomson, 1857)	1					1
<i>Amara lunicollis</i> (Schiodte, 1837)		2		1	4	7
<i>Amara spreta</i> (Dejean, 1831)	1					1
<i>Badister sodalis</i> (Duftschmid, 1812)				1		1
<i>Bembidion assimile</i> (Gyllenhal, 1810)			2	3		5
<i>Bembidion gilvipes</i> (Sturm, 1825)				12		12
<i>Bembidion guttula</i> (Fabricius, 1792)				1	1	2
<i>Bembidion mannerheimii</i> (C. Sahlberg, 1827)			8	11	6	25
<i>Calathus erratus</i> (Sahlberg, 1827)	2					2
<i>Calathus fuscipes</i> (Goeze, 1777)	7	1	1			9
<i>Calathus melanocephalus</i> (Linnaeus, 1758)	3					3
<i>Carabus arcensis</i> (Herbst, 1784)		1				1
<i>Carabus granulatus</i> (Linnaeus, 1758)			5	7	2	14
<i>Carabus violaceus</i> (Linnaeus, 1758)		4				4
<i>Clivina fossor</i> (Linnaeus, 1758)				3	1	4
<i>Dyschirius globosus</i> (Herbst, 1784)			8	4	2	14
<i>Elaphrus uliginosus</i> (Fabricius, 1792)					1	1
<i>Harpalus latus</i> (Linnaeus, 1758)	1	1	8		2	12
<i>Harpalus luteicornis</i> (Duftschmid, 1812)			1		1	2
<i>Harpalus pumilus</i> (Sturm, 1818)	1					1
<i>Harpalus rufipes</i> (Degeer, 1774)	1		1			2
<i>Harpalus smaragdinus</i> (Duftschmid, 1812)	3					3
<i>Harpalus tardus</i> (Panzer, 1797)	2		2			4
<i>Leistus ferrugineus</i> (Linnaeus, 1758)		1				1
<i>Microlestes minutulus</i> (Goeze, 1777)	7	1	1			9
<i>Olisthopus rotundatus</i> (Paykull, 1790)			1			1
<i>Oodes helopioides</i> (Fabricius, 1792) – VU				23	1	24
<i>Oxypselaphus obscurus</i> (Herbst, 1784)				4	1	5
<i>Panagaeus cruxmajor</i> (Linnaeus, 1758)					2	2
<i>Poecilus lepidus</i> (Leske, 1785)		1				1
<i>Poecilus versicolor</i> (Sturm, 1824)			8		14	22
<i>Pterostichus diligens</i> (Sturm, 1824)				7	1	8
<i>Pterostichus minor</i> (Gyllenhal, 1827)				4		4
<i>Pterostichus niger</i> (Schaller, 1783)		16	3		3	22
<i>Pterostichus nigrita</i> (Paykull, 1790)			7			7
<i>Pterostichus oblongopunctatus</i> (Fabricius, 1787)		8				8
<i>Pterostichus rhaeticus</i> (Heer, 1838)				2		2
<i>Pterostichus strenuus</i> (Panzer, 1797)				2		2
<i>Pterostichus vernalis</i> (Panzer, 1796)				7	2	9
<i>Stenolophus mixtus</i> (Herbst, 1784)				2		2
<i>Stomis pumicatus</i> (Panzer, 1796)			1			1
<i>Syntomus foveatus</i> (Fourcroy, 1785)	2					2
<i>Trechus obtusus</i> (Erichson, 1837) – LC			2			2
<i>Trechus quadristriatus</i> (Schrank, 1781)			1			1

1	2	3	4	5	6	7
3. Catopidae (Thomson, 1862)						
<i>Catops fuliginosus</i> (Erichson, 1837)	1	5	1		1	8
<i>Sciodrepoides watsoni</i> (Spence, 1815)	3	2				5
4. Curculionidae (Latreille, 1802)						
	19	16	8	5	7	55
5. Dermestidae (Latreille, 1807)						
	4	4	2			10
<i>Dermestes lanarius</i> (Illiger, 1801)	4	4	2			10
6. Dryopidae (Fleming, 1821)						
<i>Dryops ernesti</i> (Des Gozis, 1886)				2	2	4
<i>Dryops nitidulus</i> (Heer, 1841)					2	2
7. Elateridae (Leach, 1815)						
<i>Agriotes lineatus</i> (Linnaeus, 1767)					2	2
<i>Agriotes obscurus</i> (Linnaeus, 1758)				4	6	10
<i>Agrypnus murinus</i> (Linnaeus, 1758)	2	1			12	15
<i>Hemicrepidius niger</i> (Linnaeus, 1758)					3	3
<i>Hypnoidus riparius</i> (Fabricius, 1792)				28		28
<i>Prosternon tessellatum</i> (Linnaeus, 1758)		2				2
<i>Selatosomus aeneus</i> (Linnaeus, 1758)		4				4
8. Eucinetidae (Lacordaire, 1857)						
<i>Eucinetus haemorrhoidalis</i> (Germar, 1818)	1					1
9. Geotrupidae (Latreille, 1806)						
<i>Anoplotrupes stercorosus</i> (Hartmann in L.G.Scriba, 1791)		2	1			3
<i>Trypocopris vernalis</i> (Linnaeus, 1758)	3	22	7			32
10. Limnichidae (Erichson, 1846)						
<i>Limnichus sericeus</i> (Duftschmid, 1825)				8	6	14
11. Scarabaeidae (Latreille, 1802)						
<i>Aphodius coenosus</i> (Panzer, 1798)	1					1
<i>Phyllopertha horticola</i> (Linnaeus, 1758)		3				3
12. Silphidae (Latreille, 1807)						
<i>Nicrophorus investigator</i> (Zetterstedt, 1824)	1	1				2
<i>Nicrophorus vespillo</i> (Linnaeus, 1758)	10		1	2	5	18
<i>Nicrophorus vespilloides</i> (Herbst, 1783)	1	10				11
<i>Phosphuga atrata</i> (Linnaeus, 1758)		5				5
<i>Silpha carinata</i> (Herbst, 1783)		54	12			66
<i>Silpha tristis</i> (Illiger, 1798)					1	1
<i>Thanatophilus sinuatus</i> (Fabricius, 1775)					1	1
13. Staphylinidae (Latreille, 1802)						
	22	16	113	67	68	286
14. Tenebrionidae (Latreille, 1802)						
<i>Crypticus quisquilis</i> (Linnaeus, 1761)	5					5
<i>Opatrum sabulosum</i> (Linnaeus, 1761)	2					2
<i>Lagria hirta</i> (Linnaeus, 1758)		2				2
Total specimens	110	189	217	264	167	957
Total species	29	27	26	27	31	83

Species richness was relatively even: the most species (31) were found in the highly diverse complex of meadows and the fewest (26) in the complex of wet sedge meadows. The number of individuals caught varied within a fairly large range: from 110 individuals in the fallow land with psammophilous vegetation to 264 individuals in the very wet, fertile meadow near Lake Świdwie Małe (Table 1).

No species common to all habitats were identified. The species composition of the families was highly varied (Figure 2). The highest similarity (about 36%) was noted for the assemblages of wet meadows. These assemblages are very different from the others – diverse meadow, mixed forest and psammophilous vegetation, with a similarity index of only about 10%.

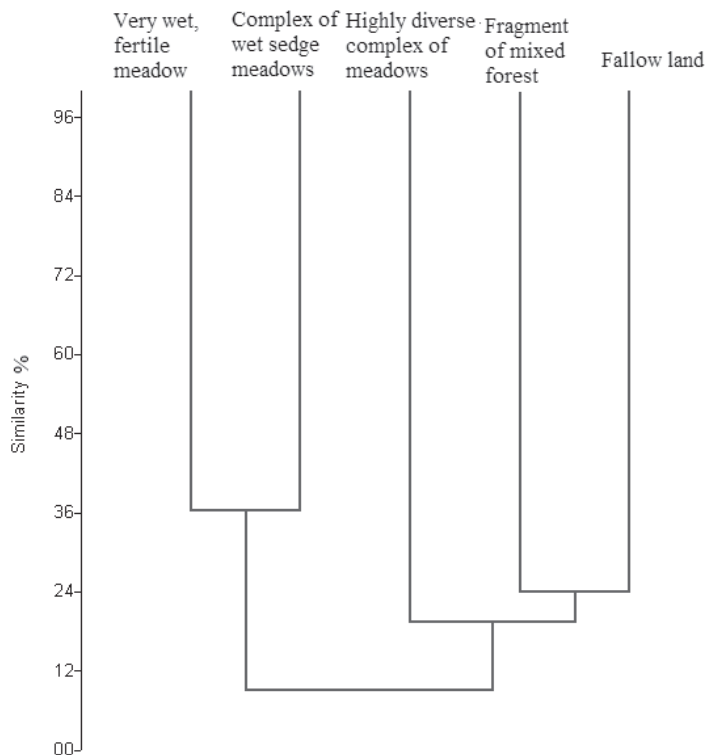


Figure 2. Similarity of the species composition of the habitats based on Jaccard's index

This indicates a great diversity of species composition and its evident dependence on the high moisture level at the site. Assemblages typical of wet habitats are on the left side of the dendrogram and assemblages of dry habitats are on the right (Figure 2).

Widely represented and fairly abundant stenobiontic hygrophilous species were noted in wet meadows: *Agonum emarginatum*, *A. fuliginosum*, *Bembidion gilvipes*, *B. guttula*, *B. mannerheimii*, *Carabus granulatus*, *Oodes helopioides*, *Oxypselaphus obscurus*, *Panagaeus cruxmajor*, *Pterostichus rhaeticus*, *P. vernalis*, *Stenolophus mixtus*, *Dryops ernesti*, *D. nitidulus*, *Hypnoidus riparius* and *Limnichus sericeus*.

Mesophilic grassland species are fairly abundant on the meadow composed of diverse habitats: *Poecilus versicolor*, *Dyschirius globosus* and *Harpalus latus*.

Mesophilic, stenobiontic forest species are dominant in the mixed forest: *Carabus violaceus*, *Pterostichus niger*, *P. oblongopunctatus*, *Abax parallelepipedus*, *Silpha carinata*, *Phosphuga atrata*, *Nicrophorus vespilloides* and *Trypocopris vernalis*.

Mesoxerophilic and xerophilic open-area species were noted in the psammophilous vegetation: *Amara aenea*, *Amara bifrons*, *Amara littorea*, *Amara spreta*, *Calathus erratus*, *Harpalus pumilus*, *H. smaragdinus*, *H. tardus*, *Microlestes minutulus*, *Syntomus foveatus*, *Crypticus quisquilis* and *Opatrum sabulosum*.

Ecologically valuable species with varying conservation status included *Oodes helopioides* (VU), and *Trechus obtusus* (LC). *Oodes helopioides* was most abundant in the wet meadow by Lake Świdwie Małe. *Trechus obtusus* was represented by single specimens.

The research is preliminary; the list of epigeic beetle species will increase considerably when the seasonal study period has been extended and other research methods have been applied.

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