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**BUTTERFLIES AND MOTHS
(LEPIDOPTERA: RHOPALOCERA, HETEROCCERA)
OF THE POLISH PART OF THE LITHUANIAN LAKE DISTRICT (NE
POLAND) – RESULTS OF PRELIMINARY RESEARCH**

Abstract

Butterflies and moths were studied in the Polish part of the Lithuanian Lake District in the scope of three nine-days expeditions in the years 2011–2013. The primary objects of the study were wetlands (particularly peat bogs and fens) and xerothermic grasslands in the Suwalski Landscape Park and its vicinity. A total of 340 species of Lepidoptera were recorded, 55 of which belonged to Rhopalocera (34% of Polish fauna) and 285 to Heterocera. More than 20 recorded species occur rarely or locally in Europe. Some of the species were recorded in NE Poland for the first time.

Keywords: Lepidoptera, faunistics, Poland, Lithuania, rare species

Introduction

The Polish part of the Lithuanian Lake District provides conditions favourable for the development of a number of groups of organisms with varied environmental

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requirements. The study area is located in the north-eastern part of Poland, recognised as a region with the most continental and severe climate (Kondracki 2009). In spite of the severe climate conditions, it is the northernmost area of occurrence of xerothermic grasslands in Poland (Herbich 2004a). The region is also remarkably rich in fens and peatbogs (Herbich 2004a). Both of the groups of habitats are of significance for the Natura 2000 programme. All of the aforementioned facts account for the exceptionally high biodiversity and value of the Eastern Suwalskie Lake District at the scale of Poland and this part of Europe. Nonetheless, literature regarding the lepidoptero fauna of the region is relatively scarce. Noctuid moths (Noctuidae) (Kokot 1995; Nowacki 1992; Nowacki and Rudny 1992) and butterflies (Rhopalocera) (Buszko 1997) are the most thoroughly studied groups, although the latter is discussed in very general terms.

The objective of this study was to expand the knowledge on the entomofauna of the Eastern Suwalskie Lake District. The research concerned Lepidoptera. Particular attention was paid to Macrolepidoptera, primarily due to the limited duration of the research and greater possibilities to collect material in the field. The limited research duration did not permit a sufficient insight into Microlepidoptera.

Study area

The Lithuanian Lake District is a part of the East-Baltic Lakeland. It includes young glacial forms originating from the last glaciation, such as: moraines, drumlins, eskers, and a number of lakes. It is a typical upland region (the highest point – 293.6 m a.s.l.) with a high rate of afforestation. It is located in the territories of four countries: Lithuania, Belarus, Russia (Kaliningrad District), and Poland (Kondracki 2009).

The south-western part of the Lithuanian Lake District is located in Poland. Four mesoregions are distinguished in the area: the Romincka Forest, the Augustowska Plain, the Western Suwalskie Lake District, and the Eastern Suwalskie Lake District (Kondracki 2009). Our study focused on the Suwalski Landscape Park (SLP) located in the south of the Eastern Suwalskie Lake District. Only study site No. 1 was located at the northern boundary of the Augustowska Plain.

SLP was established on 12 January 1976. It is the oldest and one of the most valuable landscape parks in Poland. The tasks of SLP include the protection of the postglacial landscape and unique settlements (Kondracki 2009; Walczak et al. 2001).

SLP includes a high number of various plant communities. The most frequently encountered ones include open grassy communities, often used as pastures (i.e. xerothermic grasslands), located on sunny southern slopes. Forests cover approximately 20% of the park's area. A number of fens and peatbogs

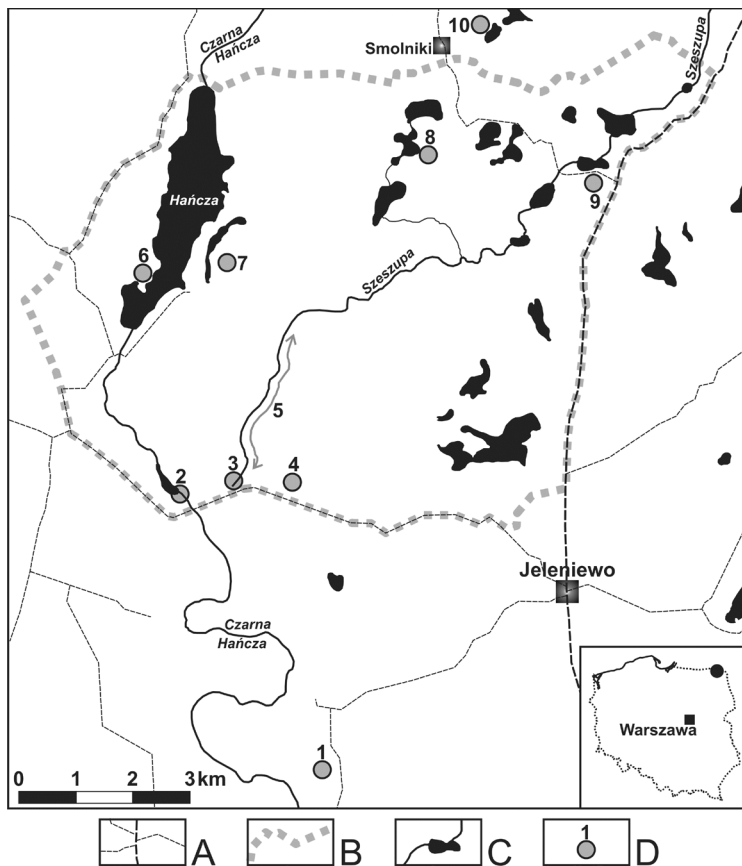


Figure 1. Study area: A – main roads, B – border of the Suwalski Landscape Park, C – larger water bodies, D – studied sites, areas and stretched of river valleys

also occur here, including “hanging fens”*, a curiosity distinguishing SLP. More than 24 lakes, three rivers, and a number of small ponds, streams, and rivers (the Czarna Hańcza, Szeszupa, and Pregoła Rivers) contribute to the hydrological wealth of the region (Walczak et al. 2001).

A total of 10 sites were analysed (Figure 1). The majority of the study sites were studied regularly. Due to limited time, the analysis of some of them was only sporadic and fragmentary. Fragmentary research is hereafter marked with (*). The study sites correspond to four squares of the UTM system. They include: (1) Żywa Woda, the area of a former sand-pit (FF20)*; (2) Malesowizna-Turtul, Turtul Esker (FF11); (3) Malesowizna-Turtul, a spring-fed fen in the well-head area of the Szeszupa River (FF10); (4) Rutka Reserve, the moraine slopes and shore of Lake Linówek with a transitional peatbog lakeshore (FF11/FF21); (5) Szeszupa River valley with xerothermic slopes, section from Malesowizna-Turtul to Wodziłki (FF10/FF11); (6) Przełomka, shore of Lake Hańcza with nearby moraine slopes near the Leszczynowa Góra hill (FF11); (7) Błaskowizna, a transitional peatbog near the south-eastern part of Lake Boczniel (FF11)*; (8) Smolniki, SE shore of Lake Jaczno with an adjacent transitional peatbog (FF21)*; (9) slopes of the Cisowa Góra hill (256 a.s.l.) (FF21)*; (10) Smolniki, a transitional peatbog near Lake Czarne (FF21).

Methods and Material

The study was carried out in the scope of three expeditions: 1–9 July 2011, 30 June – 7 July 2012, and 21–28 July 2013. The study terms correspond to observed peaks of appearance of a number of insects, particularly in NE Poland. The spring and summer aspects regarding insects frequently overlap. The applied methodology was dependant on a group Lepidoptera. In the case of butterflies (Rhopalocera) and day-flying moths (Heterocera), an entomological net was applied. Host plants were also occasionally checked for the presence of caterpillars. In the case of the remaining moths, a light-trap was used, with a 250 W Osram MVL bulb. Capturing moths by means of a light-trap was only carried out at the second and the third study site.

* Highly moistured lenticular fens lying on steep slopes which are continuously supplied with water from springs.

The identification of specimens of doubtful affinities was performed by means of examination of genital structures. This way, only the *Leptidea juvernica/sinapis* complex has not been analysed.

The majority of the species were identified in the field. Rare species and those difficult to identify were photographed (protected species) or collected. Evidential specimens are stored in the collections of the first two authors.

Results

Species checklist

A total of 340 species of Lepidoptera were recorded. Butterflies (Rhopalocera) were represented by 55 species: HesperIIDae (5), Lycaenidae (13), Nymphalidae (29), Papilionidae (1), and Pieridae (6 + complex of *Leptidea juvernica/sinapis*). Moths (Heterocera) were represented by 285 species: Saturniidae (1), Sphingidae (10), Cossidae (1), Drepanidae (8), Geometridae (67), Lasiocampidae (5), Erebidae (34), Noctuidae (100), Nolidae (3), Notodontidae (12), Limacodidae (1), Zygaenidae (6), Crambidae (19), Pyralidae (7), Adelidae (1), Elachistidae (1), Stathmopodidae (1), Micropterigidae (1), Pterophoridae (3), Argyresthiidae (2), and Plutellidae (2).

The following is the complete list of recorded species:

- HesperIIDae: *Thymelicus sylvestris* (Poda) [sites No. 1, 2, 4–6, 8, 9]; *T. lineola* (Ochsen.) [2, 4, 5]; *Ochlodes sylvanus* (Brem. et Grey) [2, 4, 5, 8]; *Heteropterus morpheus* (Pall.) [4, 5, 8]; *Pyrgus alveus* (Hübner) [2, 4].
- Lycaenidae: *Lycaena alciphron* (Rottemb.) [5, 9]; *L. dispar* (Haw.) [4, 8]; *L. hippothoe* (L.) [5]; *L. phlaeas* (L.) [2, 4, 6]; *L. tityrus* (Poda) [2, 4]; *L. virgaureae* (L.) [1, 2, 4–6, 9]; *Aricia eumedon* (Esp.) [3]; *Cupido minimus* (Fuess.) [4]; *Cyaniris semiargus* (Rottemb.) [4, 5]; *Polyommatus amandus* (Schneid.) [2, 4, 5]; *P. icarus* (Rottemb.) [1, 2, 4–6]; *Satyrrium w-album* (Kn.) [2, 5]; *Thecla betulae* (L.) [8].
- Nymphalidae: *Apatura ilia* (Den. et Schifferm.) [3]; *A. iris* (L.) [3]; *Limenitis camilla* (L.) [3]; *Argynnis aglaja* (L.) [1, 2, 4, 5, 9]; *A. adippe* (Den. et Schifferm.) [1, 2, 4–7, 9]; *A. laodice* (Pall.) [2, 3, 5]; *A. niobe* (L.) [2, 4, 5]; *A. paphia* (L.) [1, 2, 4–6]; *Boloria aquilonaris* (Stich.) [10]; *B. dia* (L.) [2, 4, 9]; *B. selene* (Den. et Schifferm.) [2, 4, 5]; *Brenthis ino* (Rottemb.) [3, 4, 5]; *Issoria lathonia* (L.) [1, 2, 4–6]; *Melitaea athalia*

- (Rottemb.) [2, 4, 5]; *M. britomartis* Ass. [2, 4–6, 9]; *M. cinxia* (L.) [2, 4, 5]; *M. phoebe* (Den. et Schifferm.) [1, 2, 4–6]; *Araschnia levana* (L.) [5]; *Aglais io* (L.) [2, 4–6]; *Aglais urticae* (L.) [2, 4–6]; *Polygonia c-album* (L.) [5]; *Vanessa atalanta* (L.) [2, 4, 5]; *V. cardui* (L.) [2, 4, 5]; *Aphantopus hyperantus* (L.) [1–6, 9]; *Coenonympha arcania* (L.) [2, 4, 5, 8]; *C. glycerion* (Borkh.) [2, 4, 5, 9]; *C. pamphilus* (L.) [1, 2, 4–6, 9]; *Hyponephele lycaon* (Rottemb.) [2]; *Maniola jurtina* (L.) [1–6, 8, 9].
- Papilionidae: *Papilio machaon* L. [1, 2, 4, 9].
 - Pieridae: *Colias hyale* (L.) [2, 4, 6]; *Gonepteryx rhamni* (L.) [2, 4, 5, 6]; *Leptidea juvernica/sinapis** complex [2, 4]; *Aporia crataegi* (L.) [2, 4, 9]; *Pieris brassicae* (L.) [5]; *P. napi* (L.) [1, 2, 4–6]; *P. rapae* (L.) [2, 4, 7–8].
 - Saturniidae: *Saturnia pavonia* (L.) [4].
 - Sphingidae: *Deilephila elpenor* (L.) [2, 3, 4]; *D. porcellus* (L.) [2]; *Hemaris tityus* (L.) [2, 6]; *Hyles euphorbiae* (L.) [2]; *H. gallii* (Rottemb.) [2, 3]; *Laothoe populi* (L.) [2, 3]; *Mimas tiliae* (L.) [2, 3]; *Smerinthus ocellata* (L.) [2, 3]; *Sphinx ligustri* L. [2]; *S. pinastri* L. [2].
 - Cossidae: *Zeuzera pyrina* (L.) [3].
 - Drepanidae: *Drepana curvatula* (Borkh.) [2, 3]; *D. falcataria* (L.) [2, 3]; *Watsonalla binaria* (Hufn.) [3]; *Habrosyne pyritoides* (Hufn.) [2, 3]; *Ochropacha duplaris* (L.) [3]; *Tethea ocellaris* (L.) [2]; *T. or* (Den. et Schifferm.) [2, 3]; *Tetheella fluctuosa* (Hübner) [3].
 - Geometridae: *Abraxas grossulariata* (L.) [3]; *A. sylvata* (Scop.) [3]; *Angerona prunaria* (L.) [2, 3]; *Arichanna melanaria* (L.) [2, 3, 10]; *Biston betularia* (L.) [2, 3]; *Cabera exanthemata* (Scop.) [3]; *C. pusaria* (L.) [2, 3]; *Chiasmia clathrata* (L.) [2]; *Deileptenia ribeata* (Cl.) [3]; *Hylaea fasciaria* (L.) [2, 3]; *Hypomecis roboraria* (Den. et Schifferm.) [3]; *Ligdia adustata* (Den. et Schifferm.) [2, 3]; *Lomaspilis marginata* (L.) [2, 3]; *L. opis* (Butler) [3]; *Lomographa bimaculata* (Fabr.) [2, 3]; *L. temerata* (Den. et Schifferm.) [3]; *Macaria alternata* (Den. et Schifferm.) [2, 3]; *M. notata* (L.) [3]; *M. wauaria* (L.) [3]; *Ourapteryx sambucaria* (L.) [3]; *Plagodis dolabraria* (L.) [2, 3]; *Stegania cararia* (Hübner) [2]; *Comibaena bajularia* (Den. et Schifferm.) [2]; *Geometra papilionaria* (L.) [2, 3]; *Hemithea aestivaria* (Hübner) [2]; *Thetidia smaragdaria* (Fabr.) [2]; *Anticollix sparsata* (Tr.) [3]; *Carsia sororiata* (Hübner) [3]; *Catarhoe cuculata* (Hufn.) [2, 3]; *Chloroclystis v-ata* (Haw.) [2, 3]; *Colostygia pectinataria* (Kn.) [2, 3]; *Euchoeca nebulata* (Scop.) [2]; *Eulithis pyropata*

- (Hüb.) [3]; *Eupithecia absinthiata* (Cl.) [2]; *E. millefoliata* (Rössler) [2]; *E. pimpinellata* (Hüb.) [3]; *E. plumbeolata* (Haw.) [2]; *E. succenturiata* (L.) [2, 3]; *E. tripunctaria* (Herr.-Schäff.) [3]; *E. venosata* (Fabr.) [3]; *E. virgaureata* (Doubl.) [3]; *Eustroma reticulata* (Den. et Schifferm.) [3]; *Gagitodes sagittata* (Fabr.) [3]; *Gandaritis pyraliata* (Den. et Schifferm.) [3]; *Hydrelia flammeolaria* (Hufn.) [2, 3]; *H. sylvata* (Den. et Schifferm.) [2, 3]; *Hydriomena impluviata* (Den. et Schifferm.) [2]; *Lampropteryx otregiata* (Metc.) [3]; *Mesoleuca albicillata* (L.) [2, 3]; *Odezia atrata* (L.) [5]; *Orthonama vittata* (Borkh.) [3]; *Pareulype berberata* (Den. et Schifferm.) [2, 3]; *Pasiphila rectangularata* (L.) [3]; *Perizoma alchemillata* (L.) [2, 3]; *P. flavofasciata* (Thunb.) [2, 3]; *Philereme transversata* (Hufn.) [3]; *P. vetulata* (Den. et Schifferm.) [2, 3]; *Pterapherapteryx sexalata* (Retz.) [3]; *Venusia blomeri* (Curt.) [2, 3]; *Xanthorhoe biriviata* (Borkh.) [2, 3]; *X. montanata* (Den. et Schifferm.) [2, 3]; *Cyclophora pendularia* (Cl.) [3]; *Idaea muricata* (Hufn.) [10]; *Scopula corrivalaria* (Kretschm.) [8]; *S. immutata* (L.) [2, 3, 7, 8]; *S. nigropunctata* (Hufn.) [2]; *S. ornata* (Scop.) [2].
- Lasiocampidae: *Malacosoma neustria* (L.) [2, 3]; *Dendrolimus pini* (L.) [2]; *Euthrix potatoria* (L.) [2, 3]; *Gastropacha quercifolia* (L.) [2, 3]; *Odonestis pruni* (L.) [2, 3].
 - Erebidae: *Atolmis rubricollis* (L.) [2, 3]; *Callimorpha dominula* (L.) [2, 3]; *Eilema complana* (L.) [2, 3]; *E. depressa* (Esp.) [2]; *E. griseola* (Hüb.) [2, 3]; *E. lutarella* (L.) [2]; *E. pygmaeola* (Doubl.) [3]; *Hyphantria cunea* (Dr.) [3]; *Lithosia quadra* (L.) [2, 3]; *Miltochrista miniata* (Forst.) [2, 3]; *Pelosia muscerda* (Hufn.) [2, 3]; *Phragmatobia fuliginosa* (L.) [2, 3]; *Spilosoma lubricipeda* (L.) [2, 3]; *S. lutea* (Hufn.) [2, 3]; *S. urticae* (Esp.) [3]; *Thumatha senex* (Hüb.) [3]; *Tyria jacobaeae* (L.) [1, 2]; *Laspeyria flexula* (Den. et Schifferm.) [2]; *Parascotia fuliginaria* (L.) [2]; *Catocala fulminea* (Scop.) [3]; *C. nupta* (L.) [2, 3]; *Lygephila pastinum* (Tr.) [2]; *Herminia tarsicrinalis* (Kn.) [2, 3]; *H. tarsipennalis* (Tr.) [2, 3]; *Macrochilo cribrumalis* (Hüb.) [8]; *Hypena proboscidalis* (L.) [2, 3]; *Hypenodes humidalis* Doubl. [3]; *Arctornis l-nigrum* (Müll.) [2, 3]; *Euproctis similis* (Fuess.) [2, 3]; *Leucoma salicis* (L.) [3]; *Orgyia antiqua* (L.) [2]; *Phytometra viridaria* (Cl.) [2]; *Trisateles emortualis* (Den. et Schifferm.) [2, 3]; *Rivula sericealis* (Scop.) [2, 3].

- Noctuidae: *Acontia trabealis* (Scop.) [2]; *Acrionicta cuspis* (Hüb.) [3]; *A. leporina* (L.) [2, 3]; *A. rumicis* (L.) [2, 3]; *A. strigosa* (Den. et Schifferm.) [3]; *Craniophora ligustri* (Den. et Schifferm.) [2, 3]; *Moma alpium* (Os.) [2, 3]; *Simyra albovenosa* (Goeze) [2, 3]; *S. nervosa* (Den. et Schifferm.) [2]; *Subacronicta megacephala* (Den. et Schifferm.) [2, 3]; *Amphipyra perflua* (Fabr.) [3]; *A. tragopoginis* (Cl.) [3]; *Eucarta virgo* (Tr.) [2, 3]; *Cucullia artemisiae* (Hufn.) [2]; *C. fraudatrix* (Eversm.) [2]; *C. umbratica* (L.) [2]; *C. verbasci* (L.) [8]; *Callopietria juvenina* (Stoll) [2]; *Deltote bankiana* (Fabr.) [8]; *D. pygarga* (Hufn.) [2, 3]; *D. uncula* (Cl.) [3]; *Pyrrhia umbra* (Hufn.) [2]; *Actinotia polyodon* (Cl.) [2]; *Agrotis exclamationis* (L.) [2, 3]; *A. segetum* (Den. et Schifferm.) [2, 3]; *Amphipoea fucosa* (Frey.) [3]; *A. oculea* (L.) [3]; *Apamea lateritia* (Hufn.) [2]; *A. lithoxyloae* (Den. et Schifferm.) [2]; *A. monoglypha* (Hufn.) [2, 3]; *A. scolopacina* (Esp.) [2]; *A. sublustris* (Esp.) [2]; *Apterogenum ypsilon* (Den. et Schifferm.) [2, 3]; *Arenostola phragmitidis* (Hüb.) [3]; *Axylia putris* (L.) [2, 3]; *Ceramica pisi* (L.) [2, 3]; *Cerapteryx graminis* (L.) [2, 3]; *Charanyca ferruginea* (Esp.) [2, 3]; *Chilodes maritima* (Tausch.) [2]; *Conisania luteago* (Den. et Schifferm.) [2]; *Cosmia pyralina* (Den. et Schifferm.) [2, 3]; *Diarsia brunnea* (Den. et Schifferm.) [2, 3]; *D. rubi* (View.) [3]; *Dypterygia scabriuscula* (L.) [2, 3]; *Enargia paleacea* (Esp.) [2, 3]; *Euplexia lucipara* (L.) [2, 3]; *Globia sparganii* (Esp.) [3]; *Graphiphora augur* (Fabr.) [3]; *Hadena bicruris* (Hufn.) [2]; *H. confusa* (Hufn.) [2]; *H. perplexa* (Den. et Schifferm.) [2]; *Helotropha leucostigma* (Hüb.) [3]; *Hydraecia micacea* (Esp.) [3]; *Hyssia cavernosa* (Eversm.) [2]; *Ipimorpha retusa* (L.) [2, 3]; *I. subtusa* (Den. et Schifferm.) [2, 3]; *Lacanobia oleracea* (L.) [2, 3]; *L. splendens* (Hüb.) [2]; *L. thalassina* (Hufn.) [2, 3]; *Lateroligia ophiogramma* (Esp.) [2, 3]; *Leucania comma* (L.) [3]; *Mamestra brassicae* (L.) [2, 3]; *Melanchra persicariae* (L.) [2, 3]; *Mythimna albipuncta* (Den. et Schifferm.) [2, 3]; *M. conigera* (Den. et Schifferm.) [2, 3]; *M. ferrago* (Fabr.) [2, 3]; *M. impura* (Hüb.) [3]; *M. pallens* (L.) [2, 3]; *M. pudorina* (Den. et Schifferm.) [2, 3]; *M. turca* (L.) [2, 3]; *Noctua fimbriata* (Schreb.) [3]; *N. interposita* (Hüb.) [2]; *N. pronuba* (L.) [2, 3]; *Ochropleura plecta* (L.) [2, 3]; *Oligia fasciuncula* (Haw.) [2, 3]; *O. latruncula* (Den. et Schifferm.) [2]; *O. strigilis* (L.) [2, 3]; *O. versicolor* (Borkh.) [2]; *Pseudeustrotia candidula* (Den. et Schifferm.) [2, 3]; *Rhyacia simulans* (Hufn.) [2]; *Sideridis reticulata*

- (Goeze) [2]; *S. rivularis* (Fabr.) [2, 3]; *Trachea atriplicis* (L.) [2, 3]; *Xestia baja* (Den. et Schifferm.) [2, 3]; *X. c-nigrum* (L.) [2, 3]; *X. triangulum* (Hufn.) [2, 3]; *Panthea coenobita* (Esp.) [3]; *Abrostola tripartita* (Hufn.) [2, 3]; *A. triplasia* (L.) [2, 3]; *Autographa bractea* (Den. et Schifferm.) [2, 3]; *A. buraetica* (Staud.) [2]; *A. gamma* (L.) [2, 3]; *A. jota* (L.) [2, 3]; *A. pulchrina* (Haw.) [2]; *Diachrysia chrysitis* (L.) [2, 3]; *Lamprotes c-aureum* (Kn.) [3]; *Macdunnoughia confusa* (Steph.) [2, 3]; *Plusia festucae* (L.) [2, 3]; *P. putnami* (Grote) [3]; *Syngrapha interrogationis* (L.) [3].
- Nolidae: *Earias clorana* (L.) [2, 3]; *Pseudoips prasinana* (L.) [2, 3]; *Nola cucullatella* (L.) [2].
 - Notodontidae: *Stauropus fagi* (L.) [2, 3]; *Cerura erminea* (Esp.) [2, 3]; *Furcula bicuspis* (Borkh.) [2, 3]; *Gluphisia crenata* (Esp.) [2, 3]; *Leucodonta bicoloria* (Den. et Schifferm.) [2, 3]; *Notodonta dromedarius* (L.) [2, 3]; *N. torva* (Hüb. n.) [3]; *N. tritophus* (Den. et Schifferm.) [2, 3]; *N. ziczac* (L.) [2, 3]; *Pheosia gnoma* (Fabr.) [2, 3]; *Phalera bucephala* (L.) [3]; *Clostera pigra* (Hufn.) [2, 3].
 - Limacodidae: *Apoda limacodes* (Hufn.) [2, 3].
 - Zygaenidae: *Adscita statices* (L.) [4]; *Zygaena filipendulae* (L.) [2, 4, 5, 6]; *Z. lonicerae* (Scheven) [4]; *Z. minos* (Den. et Schifferm.) [1, 2, 4, 5, 6, 9]; *Z. purpuralis* (Brünn.) [2, 4, 6]; *Z. viciae* (Den. et Schifferm.) [4].
 - Crambidae: *Acentria ephemerella* (Den. et Schifferm.) [2]; *Cataclysta lemnata* (L.) [2, 3]; *Elophila nymphaeata* (L.) [2, 3, 7]; *Parapoinx stratiotata* (L.) [2, 3]; *Chrysoteuchia culmella* (L.) [2, 3]; *Evergestis aenealis* (Den. et Schifferm.) [2]; *E. pallidata* (Hufn.) [2, 3]; *Cynaeda dentalis* (Den. et Schifferm.) [2]; *Epascestria pustulalis* (Hüb. n.) [2]; *Anania coronata* (Hufn.) [2, 3]; *A. lancealis* (Den. et Schifferm.) [3]; *Loxostege turbidalis* (Tr.) [2]; *Nascia ciliaris* (Hüb. n.) [3]; *Ostrinia nubilalis* (Hüb. n.) [2, 3]; *Pyrausta aerealis* (Hüb. n.) [2]; *P. nigrata* (Scop.) [2]; *Mecyna flavalis* (Den. et Schifferm.) [2, 3]; *Pleuroptya ruralis* (Scop.) [2, 3]; *Udea prunalis* (Den. et Schifferm.) [2].
 - Pyralidae: *Delplanqueia dilutella* (Den. et Schifferm.) [2, 3]; *Eurhodope cirrigerella* (Zinck.) [2]; *Hypochalcia ahenella* (Den. et Schifferm.) [2]; *Myelois circumvoluta* (Fourcr.) [2]; *Oncocera semirubella* (Scop.) [2, 4, 6]; *Hypsopygia costalis* (Fabr.) [2, 3]; *H. glaucinalis* (L.) [2, 3].
 - Adelidae: *Nemophora degeerella* (L.) [8].

- Elachistidae: *Hypercallia citrinalis* (Scop.) [2].
- Stathmopodidae: *Stathmopoda pedella* (L.) [3].
- Micropterigidae: *Micropterix aruncella* (Scop.) [3].
- Pterophoridae: *Buckleria paludum* (Zeller) [7]; *Emmelina monodactyla* (L.) [2, 3]; *Pterophorus pentadactyla* (L.) [2, 3].
- Argyresthiidae: *Argyresthia brockeella* (Hübner) [3]; *A. goedartella* (L.) [3].
- Plutellidae: *Eidophasia messingiella* (Fisch. v. Rösl.) [3]; *Plutella xylostella* (L.) [2, 3].

The most important records

Detailed information on the most interesting Lepidoptera in zoological and faunistic terms:

- *Aricia eumedon*: [3] 1-9 July 2011, a dozen exx., 1-7 July 2012, a dozen exx.
- *Boloria aquilonaris*: [10] 7 July 2011, a dozen exx., 6 July 2012, a dozen exx.
- *Melitaea phoebe*: [1] 8 July 2011, 1 ex., 7 July 2012, 2 exx.; [2] 1-8 July 2011, 4 exx., 30 June 2012, 6 exx., 3 July 2012, 12 exx.; [4] 5 July 2011, 2 exx., 6 July 2012, 7 exx.; [5] 2 July 2012, 5-6 exx., 5 July 2012, 3 exx.; [6] 4 July 2011, 2 exx., 1 July 2012, 6-7 exx.
- *Lomaspilis opis*: [3] 1 July 2012, 2 exx.
- *Stegania cararia*: [2] 30 July 2012, 1 ex.
- *Carsia sororiata*: [3] 7 July 2011, 1 ex.
- *Gagitodes sagittata*: [3] 6 July 2012, 1 ex.
- *Lampropteryx otregiata*: [3] 21-28 July 2013, 25-30 exx.
- *Odezia atrata*: [5] 2 July 2012, 1 ex.
- *Venusia blomeri*: [2] 1 July 2011, 3 exx., [3] 1-7 July 2012, 5-6 exx.
- *Scopula corrivalaria*: [8] 3 July 2011, 1 ex.
- *Eilema pygmaeola*: [3] 21 July 2013, 1 ex.
- *Hyphantria cunea*: [3] 6 July 2012, 1 ex.
- *Simyra nervosa*: [2] 26 July 2013, 1 ex.
- *Chilodes maritima*: [2] 7 July 2011, 1 ex.
- *Conisania luteago*: [2] 1 July 2011, 1 ex.
- *Oligia fasciuncula*: [2] 30 June 2012, 2 exx.
- *Autographa buraetica*: [2] 1-9 July 2011, 2-3 exx., 30 July 2012, 1 ex.

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- *Lamprotes c-aureum*: [3] 1 July 2011, 1 ex., 7 July 2011, 1 ex., 8 July 2011, 1 ex.
 - *Syngrapha interrogationis*: [3] 25 July 2013, 1 ex.
 - *Eurhodope cirrigerella*: [2] 4.07.2011, 1 ex.
 - *Stathmopoda pedella*: [3] 4 July 2011, 1 ex.
 - *Buckleria paludum*: [7] 4 July 2011, 6 exx. (as caterpillars)

Additional remarks

The study area is exceptionally abundant in Zygeanidae moths, and particularly species from the *Zygaena minos/purpuralis* complex. It is remarkable that a high percentage of them have a reduced red pattern on the wings. This is presumably related to the severe climate conditions in the area, and the phenomenon of montane melanism. This issue requires confirmation.

Discussion

A total of 340 species of Lepidoptera from the area of Eastern Suwalskie Lake District were recorded in the scope of the study. 55 of the recorded species of butterflies (Rhopalocera) constitute 34% of Polish fauna (Buszko and Nowacki 2000). The remaining 285 species belong to moths (Heterocera). The contribution is relatively high, particularly considering the low regularity of the research. Only the July aspect of the study area is accurately reflected by the results. It is also important that the climate of the Lithuanian Lake District is the most continental and severe in the entire territory of Poland (Kondracki 2009). This has a considerable effect on the vegetative period which is relatively short here. The reduced vegetative period affects the development of insects, including butterflies and moths (Buszko and Maślowski 2012). This is among others reflected in slightly shifted flight periods for certain species in the area. Some species typical of full spring (among others *Aporia crataegi*, *Melitaea cinxia*, and *Hemaris tityus*) have a delayed flight period. The species are observed in high numbers in the first half of July. Flying individuals of species typical of full summer (among others *Argynnis laodice*, *Hyponephele lycaon*, *Pyrgus alveus*) occur almost simultaneously (approximately two weeks later). The flight periods of the species begin somewhat earlier. This certainly contributes to such a high number of recorded species.

The habitat diversity of SLP and its vicinity also has a substantial effect on the diversity of the occurring butterflies and moths. The area is distinguished by the high proximity of sunny and dry moraine slopes and a lake with an adjacent peatbog located in a depression (Walczak et al. 2001). Therefore, hygrophilous and xerophilous species can often be encountered together at one site. This is particularly evident in the case of application of a light trap. This is marked in the species list (e.g. *Eilema pygmaeola* recorded at the edge of the spring-fed fen). Hygrophilous species constituted 12.4%, and xerophilous 11.8% of all of the recorded Lepidoptera.

The value of the study area is not only determined by a high number of species, but also by a relatively high contribution of rare or endangered species in this part of Europe or in its major part. Twelve of the recorded species are among others included in the Red List of threatened animals in Poland. Five of the species are vulnerable (VU) (*Aricia eumedon*, *Boloria aquilonaris*, *Melitaea britomartis*, *Carsia sororiata*, and *Buckleria paludum*), four have are near threatened (NT) (*Heteropterus morpheus*, *Lamprotes c-aureum*, *Gagitodes sagittata*, and *Scopula corrivalaria*), and four are least concern species (LC)* (*Lycaena dispar*, *Apatura ilia*, *A. iris*, and *Papilio machaon*) (Buszko and Nowacki 2002). Therefore, 12.7% of the recorded Rhopalocera are included in the national Red List. This percentage is relatively high. Four of the mentioned species are also included in the Polish Red Data Book of animals, namely *Lycaena dispar*, *Boloria aquilonaris*, *Carsia sororiata*, and *Buckleria paludum* (Buszko 2004a, 2004b; Malkiewicz 2004; Oleksa 2004). The former two are under legal protection in Poland (Rozporządzenie... 2011). The latter three are rare species associated with high and transitional peatbogs. *B. aquilonaris* is a very local and threatened species in central Europe. The primary area of its occurrence is the Scandinavian Peninsula. *C. sororiata* is a very rare, seriously threatened boreomontane species dying out throughout Central Europe. In Poland, it is primarily known from several sites in the northern part of the country. It requires active conservation. *B. paludum* is a very rare species, so far only recorded from several scattered sites in Poland (Buszko 2000, 2004b; Buszko and Masłowski 2008; Dawidowicz et al.

* In the Red List of Animals in Poland established 12 years ago there is still the system of the categories of IUCN from 1999. In this system, the LC category includes species of lower risk, which neither show clear symptoms of population decline (do not qualify the categories of endangered taxa), nor are rare; they may even locally and/or temporarily show an increase in numbers or occupied area but which require monitoring/control, because the causal factors threatening their existence have not been eliminated (Głowaciński 2002; Głowaciński & Nowacki 2004).

2013; Kudrna 2002; Malkiewicz 2004; Oleksa 2004). Other examples of rare and valuable butterflies are *Melitaea phoebe* and *Aricia eumedon*. The former is a thermophilous species typical of dry flowery meadows. It is widespread and locally common in southern Europe, and very rare and local in central Europe (Kudrna 2002). In Poland, it is particularly known from several historical records. It has been recently found in the Beskid Niski Mts and in the vicinity of Suwałki. Scattered sites in Livonia and Russia are also known, constituting its northernmost sites of occurrence in Europe (Buszko and Masłowski 2008; Dawidowicz et al. 2013; Warecki 2011). *A. eumedon* is a very local species of central Europe with highly fragmented distribution. More compact sites are located in Fennoscandia and the Alpine Region (Kudrna 2002). The species is categorised as vulnerable (VU) in the Polish Red List of Threatened Species (Buszko and Masłowski 2008). One of the most interesting recorded species is *Hyphantria cunea*. It is a North American species introduced to Europe in the 20th century. It was first recorded in Hungary in 1940. It has been observed in the south of Poland several times (first record in 1954). This is the first record from this part of Poland. In Lithuania, it is only known from one record in 1988. No resident population from central Europe is currently known. *H. cunea* is a quarantine species (Buszko and Masłowski 2012; Ivinskis 2004; Kosibowicz 2013).

It is worth emphasising that a number of the recorded species are locally or rarely encountered, and have scattered distribution in Poland or a large part of Europe. This results from a declining abundance of suitable habitats, such as fens, peat bogs, wetlands, and other wet and fertile habitats, maintained in exceptionally good condition in the study area. These species include among others: *Lomaspilis opis*, *Lampropteryx otregiata*, *Scopula corrivalaria*, *Stegania cararia*, *Gagitodes sagittata*, *Chilodes maritima*, *Autographa buraetica*, *Lamprotes c-aureum*, *Syngrapha interrogationis*, and *Stathmopoda pedella*. *L. opis* is a rare species predominantly known from the NE part of Europe, where it reaches the western boundary of its distribution (Buszko 2000; Malkiewicz 2012). *L. otregiata* is a very rare species only known from several sites. It has been only recently recorded from the Borecka Forest and Białowieża Forest (Buszko 2000). *S. corrivalaria* is known from the temperate climate zone of central Europe reaching eastern Siberia. It has been recorded from several areas in the N and NE part of Poland in very scarce numbers (Buszko 2000). *A. buraetica* is a rare and local species with the primary area of occurrence in the NE part of central Europe. It has been so far recorded from several areas in Poland. It is considered

to be infrequent or rare in Lithuania (Nowacki 1998; Nowacki and Wasiluk 2004; Vyšniauskaitė and Tamutis 2012). *L. c-aureum* is also a rare and local species in central Europe. In Poland, it is only known from several scattered localities in the north and east of the country. A decline in the number of sites of its occurrence has been recently observed (Nowacki 1998; Nowacki and Nowacka 2012). *S. interrogationis* is a boreomontane species known almost throughout central Europe, although rare and local (Nowacki 1998). The situation is similar in the case of xerothermic grasslands and other similar open and dry habitats. Species associated with this kind of habitats are also becoming more infrequent and rare, particularly in their northernmost area of occurrence. The most valuable species associated with the discussed habitats are *Eilema pygmaeola*, *Simyra nervosa*, *Conisania luteago*, *Oligia fasciuncula*, and *Eurhodope cirrigerella*. *E. pygmaeola* is a species occurring locally in central Europe. In Poland, it is known from scattered localities, particularly in the western and south-western part of the country. The species is seriously endangered in Poland (Buszko and Masłowski 2012). *C. luteago* is only known from the southern and eastern part of central Europe. It is considered to be rare in Lithuania (Nowacki 1998; Vyšniauskaitė and Tamutis 2012). *O. fasciuncula* is known almost throughout central Europe, but only locally common. It is considered to be rare in Lithuania (Nowacki 1998; Vyšniauskaitė and Tamutis 2012). *E. cirrigerella* is a rare species. After 1960, it has only been recorded in Poland at five sites (Buszko and Nowacki 2000).

It is also worth emphasising that certain species (e.g. *Melitaea phoebe*, *Eilema pygmaeola*, and *Hyphantria cunea*) have been predominantly recorded in the western or south-eastern part of Poland as well as in the territory of Lithuania and other Baltic states. The information included in this paper contributes to filling or partial filling of gaps in knowledge regarding the occurrence the species (Buszko and Nowacki 2000; Kudrna 2002; Jonko 2013). It is also important that *Odezia atrata*, *Hyphantria cunea*, *Eilema pygmaeola*, and *Stathmopoda pedella* have been recorded for the first time from the Podlasie District (Buszko and Nowacki 2000).

Rare or only locally more frequent Lepidoptera constituted approximately 15.9% of the species included in the presented list.

Literature on the entomofauna of the Polish part of the Lithuanian Lake District is still scarce. The most extensive research concerns the aquatic insects of SLP (Buczyńska et al. 2012; Buczyński et al. 2001, 2010, 2012, 2014; Buczyński and Przewoźny 2009). Research on butterflies and moths (Lepidoptera) has been

insufficient so far. The existing extensive study on the butterflies and moths of north-eastern Poland only concerns the Białowieża Forest, Biebrza National Park, and Augustów Plain (Šumpich et al. 2011). The Augustów Plain is located within the Lithuanian Lake District, but it is of entirely different character: it is largely covered by forests adjacent to the study area. This accounts for the low comparability of the results. Rare species common for these areas include: *Lampropteryx otregiata*, *Conisania luteago*, *Oligia fasciuncula*, and *Eurhodope cirrigerella*. This paper represents the first extensive study on the Lepidoptera of the Suwałki Lakeland. It should be emphasised that considering high environmental diversity and data only covering a small part of the vegetative period, the resulting list of recorded species is undoubtedly incomplete. Obtaining complete knowledge on the lepidopterofauna of this exceptionally interesting area requires further research.

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**MOTYLE (LEPIDOPTERA: RHOPALOCERA, HETEROCERA)
POLSKIEJ CZĘŚCI POJEZIERZA LITEWSKIEGO
(POLSKA PÓLNO-CNO-WSCHODNIA) – WYNIKI BADAŃ WSTĘPNYCH**

Streszczenie

Badano motyle polskiej części Pojezierza Litewskiego podczas trzech dziewięciodniowych ekspedycji w latach 2011–2013. Głównym obiektem badań były tereny podmokłe (zwłaszcza torfowiska sfagnowe i niskie) oraz murawy kserotermiczne w Suwalskim Parku Krajobrazowym i jego okolicy. Stwierdzono w sumie 340 gatunków Lepidoptera, z których 55 należało do Rhopalocera (34% fauny Polski) i 285 do Heterocera. Ponad 20 spośród wykazanych gatunków występuje rzadko lub lokalnie w Europie. Niektóre z nich stwierdzono pierwszy raz w Polsce północno-wschodniej.

Słowa kluczowe: Lepidoptera, faunistyka, Polska, Litwa, gatunki rzadkie

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