Wiadomości Entomologiczne	**38** (1) 5–46	Poznań 2019

Beetles (Coleoptera) collected from polyporoid fungi in the Pieniny National Park

Chrząszcze zebrane z owocników grzybów poliporoidalnych w Pienińskim Parku Narodowym

Piotr CHACHUŁA[1], Andrzej MELKE[2], Rafał RUTA[3], Henryk SZOŁTYS[4]

[1] Pieniny National Park, ul. Jagiellońska 107B, 34-450 Krościenko n/Dunajcem

[2] św. Stanisława 11/5, 62-800 Kalisz

[3] Department of Biodiversity and Evolutionary Taxonomy, University of Wrocław, Przybyszewskiego 65, 51-148 Wrocław, e-mail: rafal.ruta@uwr.edu.pl

[4] Park 9, 42-690 Brynek

ABSTRACT: The present paper summarises research on interactions between beetles and polyporoid fungi (Hymenochaetales, Polyporales, Russulales) in Pieniny National Park, Poland. Field studies were carried out in 2016–2018 and obtained 200 samples from 60 species of Polyporales. Over 6500 specimens of beetles were collected, most of them were identified based on morphology, totaling 194 species which represented 29 families. As a result of research conducted many interesting and rare beetles and fungi were found. Certain observed beetles were specialists on a single species or narrow taxonomic group of fungi. For example, *Mycetoma suturale* and *Derodontus macularis* were found only on *Ischnoderma* spp. fruiting bodies.

KEY WORDS: fungi, Basidiomycota, Macromycetes, beetles, ecology, trophic interactions, Carpathians.

Introduction

Research on fungivory of beetles has been very popular since 1950s and resulted in numerous monographs (e.g. BENICK 1952, WHEELER & BLACKWELL 1984, WILDING & al. 1989) and hundreds of scientific articles (overview in SCHIGEL 2012). Numerous papers on beetles associated with polyporoid fungi were published in Europe, especially in Scandinavia

(e.g. SCHIGEL 2011, SCHIGEL & al. 2004, 2006), Germany (e.g. REIBNITZ 1999), and Russia (e.g. KRASUTSKIY 1995, 1996, 1997a, 1997b, NIKITSKY & al. 1996, 1998, SCHIGEL 2002). Studies of beetles-fungus relationships are scarce in Poland and are often limited to papers dealing with selected, rare and poorly known species (e.g. KRÓLIK & al. 2005, BOROWSKI & SZCZEPKOWSKI 2011, KRÓLIK & RUTA 2016, SZAWARYN & ŻÓRALSKI 2018), faunistic reviews of mycetophagous groups of beetles (e.g. KUBISZ & al. 2010, RUTA & al. 2011), regional studies (SZUJECKI 1996, MELKE & al. 1998, KLEJDYSZ & KUBISZ 2003, MELKE & SZAFRANIEC 2003, BOROWSKI 2007, BOROWSKI & al. 2013), or ecological studies (KLIMASZEWSKI & PECK 1987, LIK 2005, LIK & BARCZAK 2005). Some faunistic data are included in mycological papers (e.g. SZCZEPKOWSKI & al. 2017) or papers focusing on larval morphology (STANIEC & al. 2016, WAGNER & GOSIK 2016). The only synthesis of the knowledge of beetles associated with sporocarps of polyporoid fungi occurring in Poland was published by BOROWSKI (2006). The current knowledge of beetles associated with fungi in Poland is fragmentary. Certain families, such as Staphylinidae are poorly studied (SZUJECKI 2017) and we lack data from many regions, especially Carpathians, where numerous old-growth forests with high diversity of fungi survive.

Wood inhabiting polyporoid fungi are members of Basidiomycota having fruiting bodies with poroid hymenophores. Polyporoid fungi include saprotrophic and parasitic species from the following orders: Hymenochaetales, Polyporales, and Russulales. They form various fruiting bodies, including effused, effused-relaxed, bracked and resupinate fruiting bodies. Polyporoid fungi play an important role in wood mineralization in forests, and as a consequence in cycling of nutrients and carbon in forest ecosystems (LONSDALE & al. 2008). Among 60 species of polyporoid fungi on which beetles were collected in this study, 40 species have already been recorded in the Pieniny National Park (WRÓBLEWSKI 1922, KOTLABA & LAZEBNIČEK 1967, ANONYMOUS 1968, GUMIŃSKA 1969, 1972, 1976, 1990, 1994, 1999, 2004, DOMAŃSKI 1991, SOKÓŁ 2000, CHACHUŁA & al. 2018a), and all the remaining ones are newly recorded in the Park.

The Pieniny National Park (=NP) covers the area of 2371 ha and protects a predominantly limestone mountain range. The majority of the area of the Pieniny NP (1725 ha, 72.8% of the area) is covered with forests. There are 13 types of forest habitats recorded in Pieniny: the largest area (939 ha, 54.4% of forested area) is covered by fir forests

(*Dentario glandulosae-Fagetum abietetosum* and *Carici-Fagetum abietetosum*), beech forests (*Dentario glandulosae-Fagetum typicum*, *Dentario glandulosae-Fagetum lunarietosum*) are less common (424 ha, 24.6% of forested area). Apart from the forested areas, meadows (*Arrhenatherion*) and the association *Campanula patula – Trisetum flavescens* are quite common (223 ha, 9.4% and 205 ha, 8.6% respectively).

The aim of the present study was to collect data on beetles associated with fungi in the Pieniny National Park in Southern Poland. The paper focuses on polyporoid fungi, data on other groups of fungi will be published elsewhere. Appendices containing exact data with locations of places where beetles were caught were published in the CHACHUŁA & al. (2018c).

Methods

Field studies were carried out in the Pieniny National Park (Fig. 1) between 2016 and 2018, from January until October (research permit no. PB-514-07/16). Beetles were collected along selected routes on 38 sampling areas (Fig. 2) and 200 localities on altitudes between 421–949 m a.s.l. (Tab. 1). The majority of sampling sites was established in the following 7 habitats: eutrophic beech forest (*Dentario glandulosae-Fagetum typicum* var. *typicum*) – 50 sites, oak-hornbeam forest (*Tilio-Carpinetum*) – 21 sites, xerothermic limestone beech forest (*Carici albae-Fagetum abietetosum*

Fig. 1. Location of the study site (A – Pieniny National Park) in Europe.
Lokalizacja terenu badań na mapie Europy (A – Pieniński Park Narodowy).

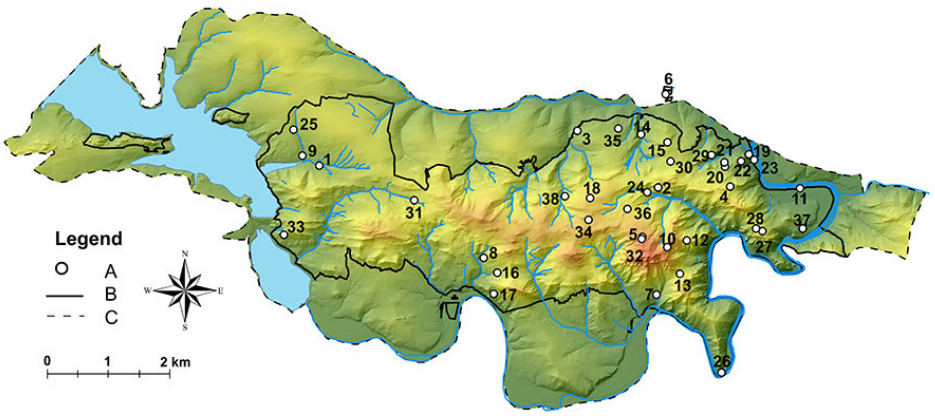

Fig. 2. Localization of sampling areas where beetles were collected in the Pieniny National Park. Marks: **A –** localization of the sampling areas (1 – Barbarzyna, 2 – Białe Skałki Mt., 3 – Biały Potok, 4 – Burzana, 5 – Droga Żydowska, 6 – Krościenko nad Dunajcem, vilage, building's surroundings management PNP, 7 – Grabczychy Mt., 8 – Grube Jodły, 9 – Harczygrunt, 10 – Kosarzyska, 11 – Kras, 12 – Ligarki, 13 – Łazek Niżny, 14 – Łonny Potok, 15 – Łupisko, 16 – Macelowa Góra Mt., 17 –Small Pine woods (*Pinus sylvestris-Calamagrostis varia*) on Macelowa Góra Mt. 18 – Mała Dolina, 19 – Młaka Pod Ociemnem, 20 – Modrzewie, 21 – Ociemny Potok, 22 – Ociemny Wierch, Mt., 23 – Pajówka, 24 – Pieniński Potok, 25 – Poręba, 26 – Pieniny Gorge, near Szopa Maćkowa, 27 – Sokolica Mt., 28 – Przełęcz Sosnów, 29 – Sowie Skałki Mt., 30 – Stolarzówka, 31 – Szkółka leśna, 32 – Trzy Korony Mt., 33 – Upszar, 34 – Wielka Dolina, 35 – Wielkie Załonie, 36 – Wyrobek, 37 – Za Piecem, 38 – Zagroń), **B** – border of the national park, **C** – buffer zone of the national park.

Lokalizacja stanowisk badawczych na obszarze Pienińskiego Parku Narodowego. Oznaczenia: **A** – stanowiska (1-38), **B** – granica parku, **C** – otulina.

Table 1. Sampling on particular altitudes.
Liczba prób na poszczególnych wysokościach

m a.s.l. m n.p.m.	number of samples liczba prób	% of samples % prób
421–500	62	31.16%
501–600	34	16.58%
601–700	53	26.63%
701–800	32	16.08%
801–900	17	8.54%
901–949	2	1.01%

var. *typicum*) – 20 sites, eutrophic beech forest (*Dentario glandulosae-Fagetum abietetosum* var. *typicum*) – 20 sites, grey alder forest (*Alnetum incanae*) – 18 sites, eutrophic beech forest (*Dentario glandulosae-Fagetum abietetosum*, *floristically poor variant*) – 16 sites, sycamore forest (*Phyllitido-Aceretum*) – 11 sites. Geographical coordinates of collecting localities were recorded with Garmin III+ GPS receiver. Data on the condition and number of sporocarps were noted. Fungi were identified with the use of a compound microscope Biolar PZO with Nomarski interference contrast and immersion objective (100 × magnification). Microscope slides were prepared from fresh specimens in water, Melzer's reagent, solution of Congo Red or Cotton Blue (CLEMENÇON 2009). Species were identified with the key by HANSEN & KNUDSEN (2000). Taxonomy of fungi was adopted after Index Fungorum (2018). Categories of threat are adopted after WOJEWODA & ŁAWRYNOWICZ (2006). Data on the occurrence of rare species after critical checklists (WOJEWODA 2003) and internet database of fungi in mycological literature (KUJAWA 2016).

Beetles were collected with entomological net, aspirator, sometimes also Winkler apparatus. Simplified Scheerpeltz fluid (96% ethanol mixed in equal proportion with 10% aquatic solution of acetic acid, according to A. MELKE, unpublished) was used as the conservation agent. The following data was noted in the field: habitat, species of fungus (when identifiable in the field), substrate on which fungus was growing, stage of decomposition of fungi and number of fruiting bodies on which beetles were collected. Insects were identified with the use of a stereomicroscope (Carl Zeiss or Nikon) and identification keys (i.a. "Die Käfer Mitteleuropas" and "Keys for the Identification of Polish Insects" series, ASSING & SCHÜLKE 2012). Taxonomy and systematics of Coleoptera was adopted after the Catalogue of Palaearctic Coleoptera (LÖBL & SMETANA 2004, 2006, 2007, 2008, 2010). Categories of threat are adopted after Polish Red List of Animals (PAWŁOWSKI & al. 2002).

Results

Fungi

During the survey, beetles were collected from approximately 1000 fruiting bodies of 60 species (Tab. 2), belonging to 12 families of fungi: Bondarzewiaceae (2), Cystostereaceae (1), Fomitopsidaceae (6), Ganodermataceae (2), Gloeophyllaceae (3), Hapalopilaceae (3), Hymenochaetaceae (11), Meripilaceae (2), Meruliaceae (4), Polyporaceae (23) and Steccherinaceae (2). Among fungi, 18 species were protected, rarely

collected or included in the red list of Macromycetes of Poland (WOJEWODA & ŁAWRYNOWICZ 2006, Rozporządzenie 2014). Three of them are endangered: *Dacryobolus karstenii, Fomitopsis rosea, Podofomes trogii*, 7 are vulnerable: *Bondarzewia mesenterica*, *Cystostereum murrayi, Dichomitus campestris, Ganoderma carnosum, Ischnoderma benzoinum, I. resinosum, Pycnoporellus fulgens*, and 6 are rare: *Antrodia sinuosa, Climacocystis borealis*, *Inonotus cuticularis*, *Phlebia rufa*, *Sarcodontia crocea* and *Stechcerinum fimbriatum*. *Antrodiella mentschulensis* is a very rare species, previously recorded in Poland from Białowieski NP only (KARASIŃSKI & WOŁKOWYCKI 2015). The following 20 species of polyporoid fungi are newly recorded in the Pieniny NP: *Antrodia sinuosa*, *Antrodiella mentschulensis*, *Dacryobolus karstenii*, *Fuscoporia ferruginosa*, *Inonotus cuticularis*, *Inonotus hastifer*, *Ischnoderma resinosum*, *Laetiporus sulphureus*, *Meripilus giganteus*, *Oxyporus ravidus*, *Phaeolus schweinitzii*, *Phellinus igniarius*, *Phylloporia ribis*, *Polyporus squamosus*, *Pseudoinonotus dryadeus*, *Skeletocutis carneogrisea*, *Steccherinum fimbriatum*, *Trametes suaveolens*, *Xanthoporia radiata*.

Table 2. A list of fungi that were associated with particular species of beetles (Coleoptera). Consistency classes introduced herein are marked with asterisk (*)

Grzyby związane z poszczególnymi gatunkami chrząszczy (Coleoptera). Klasy konsystencji owocników zaproponowane w bieżącym artykule oznaczono gwiazdką (*)

Fungus Grzyb	Associated Coleoptera [total number of species in bracket] Związane chrząszcze [w nawiasie liczba gatunków]	Consistency class [after SCHIGEL et al. 2004 and own data] Klasa konsystencji [za Schigel et al. 2004]
1	2	3
Bondarzewiaceae		
Bondarzewia mesenterica (SCHAEFF.) KREISEL	*Catops picipes*, *Agaricochara latissima*, *Atheta aeneicollis*, *A. castanoptera*, *A. celata*, *A. corvina*, *A. crassicornis*, *A. liturata*, *A. marcida*, *A. sodalis*, *A. longicornis*, *Bolitochara lucida*, *Gyrophaena poweri*, *G. pulchella*, *Lordithon bimaculatus*, *L. lunulatus*, *Oxypoda alternans*, *O. arborea*, *O. formosa*, *Proteinus brachypterus*, *P. crenulatus*, *Quedius lateralis*, *Xylostiba monilicornis*, *Omosita depressa*, *Rhizophagus dispar*, *Cryptophagus* sp., *Hallomenus binotatus* [27]	Laetiporoid
Heterobasidion abietinum NIEMELÄ & KORHONEN	*Dexiogyia corticina* [1]	Fomitoid

1	2	3
Cystostereaceae		
Cystostereum murrayi (BERK. & M.A. CURTIS) POUZAR	*Cis bidentatus* [1]	Resupinatoid*
Fomitopsidaceae		
Fomitopsis pinicola (SWARTZ: FR.) P.KARST.	*Atomaria* sp., *Cis dentatus, C. glabratus, C. quadridens, Dorcatoma punctulata, Epuraea* sp., *Gyrophaena boleti, G. manca, Othius punctulatus, Peltis ferruginea, Phloeocharis subtilissima, Phymatura brevicollis, Pteryngium crenatum, Rhizophagus dispar, Scaphidium quadrimaculatum* [15]	Fomitoid
Fomitopsis rosea (ALB. & SCHWEIN: Fr.) P. KARST.	*Gyrophaena boleti*, *Cis dentatus*, *C. glabratus* [3]	Fomitoid
Postia caesia (SCHRAD.) P. KARST.	*Peltis ferruginea*, unidentified Latridiidae [2]	Tyromycetoid
Postia stiptica (PERS.) JÜLICH	*Atheta castanoptera*, *A. crassicornis*, *A. sodalis*, *Megarthrus denticollis*, *Proteinus crenulatus* [5]	Tyromycetoid
Phaeolus schweinitzii (FR.: FR.) PAT.	*Atheta aeneipennis, A. crassicornis, A. dadopora, A. picipes, A. sodalis, A. subtilis, Gyrophaena manca, Hallomenus binotatus, Lordithon lunulatus, Megarthrus depressus, M. hemipterus, Proteinus atomarius, Tachinus laticollis, T. pallipes* [14]	Xanthochroic
Ganodermataceae		
Ganoderma applanatum (PERS.) PAT.	*Acalles* sp., *Anisotoma humeralis, Atheta pallidicornis, Bolitochara obliqua, Bolitophagus reticulatus, Cerylon histeroides, Cis castaneus, C. jacquemartii, Cryptophagus* sp., *Gyrophaena boleti, G. gentilis, Mycetina cruciata, Rhizophagus dispar, Scaphisoma boreale, Sepedophilus testaceus* [15]	Fomitoid
Ganoderma carnosum PAT.	*Cis castaneus* [1]	Fomitoid
Gloeophyllaceae		
Gloeophyllum abietinum (BULL.) P. KARST.	*Gyrophaena strictula* [1]	Gloeophylloid*
Gloeophyllum odoratum (WULF.: FR.) IMAZ.	*Mniophila muscorum* [1]	Gloeophylloid*
Gloeophyllum sepiarium (WULFEN) P. KARST.	*Eusphalerum longipenne*, *Gyrophaena affinis*, *G. bihamata*, *G. manca*, *G. minima*, *G. poweri*, *G. rousi*, *G. strictula*, *Oxypoda formosa* [9]	Gloeophylloid*

1	2	3
Hapalopilaceae		
Climacocystis borealis (Fr.) Kotl. & Pouzar	*Acrolocha amabilis, Anoplotrupes stercorosus, Atheta castanoptera, A. corvina, A.crassicornis, A. dadopora, A. marcida, A.theta nigritula, A.paracrassicornis, A. picipes, A. ravilla, A. sodalis, Autalia longicornis, Bolitochara obliqua, Lordithon lunulatus, Megarthrus hemipterus, Omalium rivulare, Oxypoda alternans, O. formosa, Proteinus brachypterus, P.crenulatus, P. laevigatus, Tachinus laticollis, Xylostiba monilicornis* [24]	Climacocystoid*
Ischnoderma benzoinum (Wahlenb.: Fr.) P. Karst.	*Atheta britanniae, Cerylon ferrugineum, C. histeroides, Cis castaneus, C. dentatus, Derodontus macularis, Lordithon bimaculatus, Mycetoma suturale, Othius punctulatus, Quedius xanthopus, Rhizophagus dispar* [11]	Tyromycetoid
Ischnoderma resinosum (Fr.) P.Karst.	*Mycetoma suturale* [1]	Tyromycetoid
Hymenochaetaceae		
Fuscoporia ferruginosa (Schrad.) Murrill	*Bolitochara lucida* [1]	Fomitoid
Inonotus cuticularis (Bull.) P. Karst.	*Atheta excelsa*, *A. crassicornis, A. picipes*, *Tetratoma fungorum*, *Cryptophagus* sp., *Cis bidentatus* [6]	Xanthochroic
Inonotus hastifer Pouzar	*Acrulia inflata*, *Bolitochara obliqua* [2]	Xanthochroic
Mensularia nodulosa (Fr.) T. Wagner & M. Fisch.	*Acrulia inflata*, *Atheta pallidicornis*, *Bolitochara obliqua*, *Phloeocharis subtilissima*, *Rhizophagus dispar*, *Cerylon ferrugineum* [6]	Xanthochroic
Phellinopsis conchata (Pers.) Y.C. Dai	*Sepedophilus testaceus* [1]	Fomitoid
Phellinus hartigii (Allesch. & Schnabl.) Pat.	*Haploglossa villosula*, *Neuraphes elongatulus*, *Phloeocharis subtilissima*, *Scaphisoma boreale* [4]	Fomitoid
Phellinus igniarius (L.) Quél.	*Agathidium rotundatum*, *Phosphuga atrata*, *Pocadius ferrugineus* [3]	Fomitoid
Phellinus punctatus (Fr.) Pilát	*Ennearthron cornutum* [1]	Fomitoid
Phylloporia ribis (Schumach.) Ryvarden	*Agathidium varians*, *Phosphuga atrata*, *Scaphisoma agaricinum*, *Ennearthron cornutum*, *Scaphidema metallica* [5]	Fomitoid
Pseudoinonotus dryadeus (Pers.) T. Wagner & M. Fisch.	*Paromalus parallelepipedus*, *Quedius mesomelinus*, *Bolitochara lucida* [3]	Xanthochroic

1	2	3
Xanthoporia radiata (SOWERBY) ŢURA, ZMITR., WASSER, RAATS & NEVO.	*Leptusa pulchella*, *Epuraea* sp., *Pocadius ferrugineus*, *Rhizophagus bipustulatus*, *R. dispar*, *Atomaria* sp., *Cerylon ferrugineum*, *C. histeroides*, *Stephostethus angusticollis*, *Litargus connexus*, *Mycetophagus multipunctatus*, *M. quadripustulatus*, *Abdera flexuosa* [13]	Xanthochroic
Meripilaceae		
Meripilus giganteus (PERS.) P. KARST.	*Acrolocha amabilis, Anoplotrupes stercorosus, Atheta aeneicollis, A. aeneipennis, A. britanniae, A. castanoptera, A. celata, A.corvina, A. crassicornis, A. dadopora, A. excelsa, A. fungicola, A. gagatina, A.laticollis, A. marcida, A. nigritula, A. pallidicornis, A. paracrassicornis, A. picipes, A. ravilla, A.sodalis, A.taxiceroides, Atomaria* sp., *Autalia longicornis, Bisnius fimetarius, B. puella, Bolitochara obliqua, Catops tristis, Cryptophagus* sp., *Gyrohypnus punctulatus, Gyrophaena poweri, Habrocerus capillaricornis, Lordithon lunulatus, L. trimaculatus, Megarthrus depressus, Nargus wilkini, Nicrophorus vespilloides, Omalium rivulare, Ontholestes tesselatus, Oxypoda alternans, O. arborea, Philonthus addendus, Philonthus marginatus, Philonthus succicola, P.tenuicornis, Phyllodrepa nigra, Phymatura brevicollis, Proteinus brachypterus, P. crenulatus, Quedius cinctus, Q. lucidulus, Q. maurus, Q.mesomelinus mesomelinus, Q. xanthopus, Tachinus humeralis, T. laticollis, T. pallipes, T. subterraneus, Xylostiba monilicornis* [59]	Tyromycetoid
Meruliaceae		
Dacryobolus karstenii (BRES.) OBERW. EX PARMASTO	*Atheta pallidicornis, Hallomenus binotatus* [2]	Resupinatoid*
Phlebia radiata FR.	*Gyrophaena bihamata, G. gentilis, G. manca, G. minima, Lordithon lunulatus, Orthoperus corticalis, Oxypoda formosa* [7]	Phlebioid*
Phlebia rufa (PERS.: FR.) M.P. CHRIST.	*Atheta sodalis, Bolitochara obliqua, Gyrophaena manca, G. minima, Mycetophagus ater, Orchesia undulata, Scaphisoma agaricinum* [7]	Phlebioid*
Phlebia tremellosa (SCHRAD.) NAKASONE & BURDS.	*Acrulia inflata* [1]	Phlebioid*
Sarcodontia crocea (SCHWEIN.) KOTL.	*Acrulia inflata, A. crassicornis, A. picipes, A. ravilla, A. sodalis, Autalia longicornis, Cartodere nodifer, Dinaraea aequata, Gyrophaena manca, Lordithon lunulatus, Megarthrus depressus, Oxypoda alternans, Proteinus crenulatus, Rhizophagus bipustulatus, Scaphidium quadrimaculatum, Scaphisoma agaricinum, S. boleti, Stenus humilis, Uleiota planatus* [19]	-

1	2	3
Polyporaceae		
Antrodia serialis (Fr.) Donk	*Quedius xanthopus, Cryptophagus* sp., *Epuraea* sp., *Atheta sodalist, Peltis ferruginea, Cis dentatus* [6]	Fomitoid
Antrodia sinuosa (Fr.) P. Karst.	*Atomaria* sp., *Peltis ferruginea* [2]	Fomitoid
Antrodiella mentschulensis (Pilát ex Pilát) Melo & Ryvarden	*Acrulia inflata, Atheta pallidicornis, Ennearthron cornutum, Epuraea* sp., *Lordithon lunulatus, Proteinus crenulatus* [6]	Tyromycetoid
Bjerkandera adusta (Willd.) P. Karst.	*Acrulia inflata, Atheta britanniae, A. castanoptera, A. crassicornis, A. euryptera, A. pallidicornis, A. picipes, Bolitochara obliqua, Cyllodes ater, Dacne rufifrons, Epuraea* sp., *Gabrius splendidulus, Lordithon lunulatus, L. trimaculatus, Meligethes* sp., *Mycetophagus ater, M. quadripustulatus, Rhizophagus bipustulatus* [18]	Trametoid
Cerrena unicolor (Bull.: Fr.) Murril	*Agaricochara latissima* [1]	Trametoid
Coriolopsis troggi (Berk.) S. Domański	*Bolitochara obliqua*, *Dropephylla linearis*, *Gyrophaena manca* [3]	Trametoid
Daedaleopsis confragosa (Bolt.: Fr.) J. Schröt	*Agaricochara latissima, Atheta laticollis, A. nigritula, A. sodalis, Bolitochara obliqua, Cis castaneus, Epuraea* sp., *Gyrophaena lucidula, G. manca, G. minima, Omalium rivulare, Phloeocharis subtilissima* [12]	Trametoid
Dichomitus campestris (Quél.) S. Domański & Orlicz	*Ennearthron cornutum* [1]	Fomitoid
Fomes fomentarius (L.) Gillet	*Bolitochara obliqua, Bolitophagus reticulatus, Cartodere nodifer, Cis glabratus, C.jacquemartii, Epuraea* sp., *Rhizophagus dispar* [7],	Fomitoid
*Laetiporus sulphureus (*Bull.: Fr.) Murrill	*Aneurus avenius, Aploderus caelatus, Atheta aeneicollis, A. aeneipennis, A. britanniae, A. castanoptera, A. celata, A. corvina, A.crassicornis, A. dadopora, A. gagatina, A. liturata, A. marcida, A.nigritula, A. ravilla, A. sodalis, Autalia longicornis, A. rivularis, Batophila rubi, Bisnius fimetarius, Cartodere nodifer, Catops kirbyi kirbyi, Cercyon* sp., *Colenis immunda, Cryptophagus* sp., *Cyllodes ater, Eledona agricola, Epuraea* sp., *Gnathoncus nannetensis, Gyrophaena affinis, G. boleti, G. fasciata, G. gentilis, G. joyi, G. manca, G minima, G. poweri, G.rousi, Hallomenus binotatus, Hermaeophaga mercurialis, Lordithon bimaculatus, L.lunulatus, L. thoracicus, Margarinotus striola succicola,. Megarthrus denticollis, M. depressus, M.nitidulus, Megasternum concinnum, Octotemnus glabriculus, Omalium*	Piptoporoid

1	2	3
	septentrionis, Orthoperus corticalis, Oxypoda arborea, O. formosa, Oxyporus maxillosus, Philonthus tenuicornis, Phymatura brevicollis, Pocadius adustus, P. ferrugineus, Proteinus brachypterus, P.laevigatus, Rugilus rufipes, Scaphisoma agaricinum, S. boleti, S. obenbergeri, Tachinus pallipes, T. subterraneus [66]	
Lenzites betulina (L.) FR.	*Agaricochara latissima, Atheta picipes, A. sodalis, Bolitochara obliqua, Gyrophaena manca, G. poweri, Octotemnus glabriculus, Sulcacis fronticornis* [8]	Trametoid
Podofomes trogii (FR.) POUZAR	*Cis castaneus, Ennearthron cornutum* [2]	Trametoid
Polyporus badius (PERS.) SCHWEIN	*Atheta crassicornis, A. pallidicornis, A.picipes, A. subtilis, Bolitochara lucida, Cis castaneus, C. jacquemartii, Gyrophaena gentilis, G. manca, G. minima, G. poweri, Oxypoda formosa, Phloeonomus sjobergi* [13]	Piptoporoid
Polyporus squamosus (HUDS.) FR.	*Agathidium varians, Aleochara villosa, Atheta aeneicollis, A. castanoptera, A. crassicornis, A. dadopora, A. fungicola, A. nigra, A. pallidicornis, A. paracrassicornis, A. picipes, A.ravilla, Bolitochara obliqua, Cartodere nodifer, Cerylon ferrugineum, Cis bidentatus, C. glabratus, Dienerella vincenti, Dochmonota clancula, Epuraea* sp., *Gyrophaena affinis, G.gentilis, G. manca, G. poweri, G.strictula, Hallomenus binotatus, Lordithon lunulatus, Megarthrus depressus, Mycetina cruciata, Mycetophagus ater, M. multi-punctatus, M. quadripustulatus, Orthoperus rogeri, Oxypoda alternans, O. formosa, Pediacus dermestoides, Pocadius adustus, P. ferrugineus, Rhizophagus dispar, Scaphisoma agaricinum, S. subalpinum, Sericoderus lateralis, Thymalus limbatus, Triphyllus bicolor* [44]	Piptoporoid
Pycnoporellus fulgens (FR.) DONK	*Dropephylla linearis, Agathidium pisanum, A. rotundatum, Atheta nigritula Atomaria* sp., *Bolitochara lucida, Ceruchus chrysomelinus, Cis glabratus, C. quadridens, Epuraea* sp., *Gyrophaena manca, G. strictula, Hallomenus axillaris, Orthoperus rogeri, Phloeocharis subtilissima, Pteryngium crenatum* [16]	Tyromycetoid
Skeletocutis carneogrisea A. DAVID	*Scaphisoma agaricinum* [1]	Fomitoid
Trametes gibbosa (PERS.: FR.) FR.	*Acrulia inflata, Agaricochara latissima, Agathidium pisanum, Atheta britanniae, A. crassicornis, A.gagatina, A. pallidicornis, A. picipes, Bolitochara obliqua, Bolitophagus reticulatus, Cerylon fagi, C. histeroides, C.boleti, C. castaneus, C. submicans,*	Trametoid

1	2	3
	Epuraea sp., *Gyrophaena boleti, G. gentilis, G. manca, G.minima, G. nana, G. poweri, G.strictula, Hermaeophaga mercurialis, Lordithon trimaculatus, Octotemnus glabriculus, Orthoperus rogeri, Oxypoda formosa, Phloeonomus sjobergi, Phymatura brevicollis, P. brevicollis, Quedius plagiatus, Scaphisoma boleti* [33]	
Trametes hirsuta (WULF.: FR.) PILÁT	*Agaricochara latissima, Cis villosulus, Gyrophaena manca, Leptusa pulchella, Octotemnus glabriculus, Sulcacis fronticornis, S. nitidus* [7]	Trametoid
Trametes pubescens (SCHUMACH.) PILÁT	*Octotemnus glabriculus, O. mandibularis, Trachodes hispidus* [3]	Trametoid
Trametes suaveolens (L.) FR.	*Atheta sodalis, Epuraea* sp., *Gyrophaena boleti, G. manca, Octotemnus glabriculus, Phloeonomus pusillus, Sulcacis nitidus* [7]	Trametoid
Trametes versicolor (L.: FR.) PILÁT	*Agaricochara latissima, Atheta castanoptera, A.crassicornis, A.dadopora, Autalia rivularis, Bisnius fimetarius, Bolitochara bella, Catops picipes, Cerylon histeroides, Cis boleti, C. castaneus, C. fissicornis, C.micans, C. submicans, Epuraea* sp., *Lordithon lunulatus, Meotica filiformis, Octotemnus glabriculus, Omalium rivulare, Phloeocharis subtilissima, Rugilus rufipes, Sciodrepoides fumatus, Sinodendron cylindricum* [23]	Trametoid
Trichaptum abietinum (DICKS.: FR.) RYVARDEN	*Acrulia inflata, Ennearthron cornutum, Oxypoda formosa, Phloeonomus punctipennis, Rhyncolus elongates* [5]	Trichaptoid
unidentified polyporoid fungus,	*Cryptophagus* sp., *Orthoperus rogeri* [2]	Fomitoid
Schizophoraceae		
Oxyporus ravidus (FR.) BONDARTSEV & SINGER	*Byrrhus luniger, Ennearthron cornutum* [2]	Tyromycetoid
Steccherinaceae		
Steccherinum fimbriatum (PERS.: FR.) J. ERIKSS.	*Staphylinus erythropterus* [1]	Hydnoid
Steccherinum ochraceum (PERS.: FR.) S.F. GRAY	*Leptusa fumida* [1]	Hydnoid

Beetles (Coleoptera)

200 samples were collected, containing 6557 specimens of beetles, most of them identified to species (Tab. 3, 4). In case of 5 species, beetles were identified only in the field or based on photographs. Number of specimens of beetles in a single sample varied significantly. The largest sample contained 523 specimens and 21 species of beetles; it was collected from a fruiting body of *Meripilus giganteus*. In many samples,

Table 3. A list of beetles and fungi on which beetles were collected.
N – species newly recorded in Pieniny Mts., NP – species newly recorded in Poland

Wykaz chrząszczy i grzybów na których zostały zebrane
N – gatunek nowy dla Pienin, NP – gatunek nowy dla Polski

Coleoptera	Fungi [total number of species in bracket]	Remarks
1	2	3
Hydrophilidae [2]		
Cercyon sp.	*Laetiporus sulphureus* [1]	
Megasternum concinnum (MARSHAM, 1802)	*Laetiporus sulphureus* [1]	N
Histeridae [3]		
Gnathoncus nannetensis (MARSEUL 1862)	*Laetiporus sulphureus* [1]	N
Margarinotus striola succicola (THOMSON, 1862)	*Laetiporus sulphureus* [1]	
Paromalus parallelepipedus (HERBST, 1792)	*Pseudoinonotus dryadeus* [1]	N
Leiodidae [10]		
Agathidium pisanum BRISOUT, 1872	*Fomitopsis betulina*, *Pycnoporellus fulgens*, *Trametes gibbosa* [3]	N
Agathidium rotundatum (GYLLENHAL, 1827)	*Phellinus igniarius*, *Pycnoporellus fulgens* [2]	N
Agathidium varians BECK, 1817	*Phylloporia ribis*, *Polyporus squamosus* [2]	N
Anisotoma humeralis (HERBST, 1791)	*Gonoderma applanatum* [1]	N
Catops kirbyi kirbyi (W. SPENCE, 1813)	*Laetiporus sulphureus* [1]	N
Catops picipes (FABRICIUS, 1787)	*Bondarzewia mesenterica*, *Trametes versicolor* [2]	N
Catops tristis tristis (PANZER, 1794)	*Meripilus giganteus* [1]	N
Colenis immunda (STURM, 1807)	*Laetiporus sulphureus* [1]	N
Nargus wilkini (W. SPENCE, 1913)	*Meripilus giganteus* [1]	N
Sciodrepoides fumatus (W. SPENCE, 1813)	*Trametes versicolor* [1]	N
Silphidae [2]		
Nicrophorus vespilloides HERBST, 1783	*Meripilus giganteus* [1]	
Phosphuga atrata (LINNAEUS, 1758)	*Phellinus igniarius*, *Phylloporia ribis* [2]	
Staphylinidae [114]		
Acrolocha amabilis (HEER, 1841)	*Climacocystis borealis*, *Meripilus giganteus* [2]	
Acrulia inflata (GYLLENHAL, 1813)	*Antrodiella mentschulensis*, *Bjerkandera adusta*, *Inonotus hastifer*, *Mensularia nodulosa*, *Phlebia radiata*, *P. tremellosa*, *Sarcodontia crocea*, *Trametes gibbosa*, *Trichaptum abietinum* [9]	

1	2	3
Agaricochara latissima (STEPHENS, 1832)	*Bondarzewia mesenterica*, *Cerrena unicolor*, *Daedaleopsis confragosa*, *Lenzites betulinus*, *Trametes gibbosa*, *T. versicolor* [6]	N
Aleochara villosa MANNERHEIM 1830	*Polyporus squamosus* [1]	N
Aploderus caelatus (GRAVENHORST, 1802)	*Laetiporus sulphureus* [1]	N
Atheta aeneicollis (SHARP, 1869)	*Bondarzewia mesenterica*, *Laetiporus sulphureus*, *Meripilus giganteus*, *Polyporus squamosus* [4]	N
Atheta aeneipennis (THOMSON, 1856)	*Laetiporus sulphureus*, *Meripilus giganteus*, *Phaeolus schweinitzii* [3]	N
Atheta britanniae BERNHAUER & SCHEERPELTZ, 1926	*Bjerkandera adusta*, *Ischnoderma benzoinum*, *Laetiporus sulphureus*, *Meripilus giganteus*, *Trametes gibbosa* [5]	N
Atheta castanoptera (MANNERHEIM 1830)	*Bjerkandera adusta*, *Bondarzewia mesenterica*, *Climacocystis borealis*, *Laetiporus sulphureus*, *Meripilus giganteus*, *Polyporus squamosus*, *Postia stiptica*, *Trametes versicolor* [8]	N
Atheta celata (ERICHSON, 1837)	*Bondarzewia mesenterica*, *Laetiporus sulphureus*, *Meripilus giganteus* [3]	N
Atheta corvina (THOMSON, 1856)	*Bondarzewia mesenterica*, *Climacocystis borealis*, *Laetiporus sulphureus*, *Meripilus giganteus* [4]	N
Atheta crassicornis (FABRICIUS, 1793)	*Bjerkandera adusta*, *Bondarzewia mesenterica*, *Climacocystis borealis*, *Inonotus cuticularis*, *Laetiporus sulphureus*, *Meripilus giganteus*, *Phaeolus schweinitzii*, *Polyporus badius*, *P. squamosus*, *Postia stiptica*, *Sarcodontia crocea*, *Trametes gibbosa*, *T. versicolor* [13]	N
Atheta dadopora THOMSON, 1867	*Climacocystis borealis*, *Laetiporus sulphureus*, *Meripilus giganteus*, *Phaeolus schweinitzii*, *Polyporus squamosus*, *Trametes versicolor* [6]	N
Atheta euryptera (STEPHENS, 1832)	*Bjerkandera adusta* [1]	N
Atheta excelsa BERNHAUER, 1911	*Inonotus cuticularis*, *Meripilus giganteus* [2]	N
Atheta fungicola (THOMSON, 1852)	*Meripilus giganteus*, *Polyporus squamosus* [2]	N
Atheta gagatina (BAUDI, 1848)	*Laetiporus sulphureus*, *Meripilus giganteus*, *Trametes gibbosa* [3]	N
Atheta laticollis (STEPHENS, 1832)	*Daedaleopsis confragosa*, *Meripilus giganteus* [2]	N
Atheta liturata (STEPHENS, 1832)	*Bondarzewia mesenterica*, *Laetiporus sulphureus* [2]	N

1	2	3
Atheta marcida (ERICHSON, 1837)	*Bondarzewia mesenterica*, *Climacocystis borealis*, *Laetiporus sulphureus*, *Meripilus giganteus* [4]	N
Atheta nigra (KRAATZ, 1856)	*Polyporus squamosus* [1]	N
Atheta nigritula (GRAVENHORST, 1802)	*Climacocystis borealis*, *Daedaleopsis confragosa*, *Laetiporus sulphureus*, *Meripilus giganteus*, *Pycnoporellus fulgens* [5]	N
Atheta pallidicornis (THOMSON, 1856)	*Antrodiella mentschulensis*, *Bjerkandera adusta*, *Dacryobolus karstenii*, *Gonoderma applanatum*, *Mensularia nodulosa*, *Meripilus giganteus*, *Polyporus badius*, *P. squamosus*, *Trametes gibbosa* [8]	N
Atheta paracrassicornis BRUNDIN, 1954	*Climacocystis borealis*, *Meripilus giganteus*, *Polyporus squamosus* [3]	N
Atheta picipes (THOMSON, 1856)	*Bjerkandera adusta*, *Climacocystis borealis*, *Inonotus cuticularis*, *Lenzites betulinus*, *Meripilus giganteus*, *Phaeolus schweinitzii*, *Polyporus badius*, *P. squamosus*, *Sarcodontia crocea*, *Trametes gibbosa* [10]	N
Atheta ravilla (ERICHSON, 1839)	*Climacocystis borealis*, *Laetiporus sulphureus*, *Meripilus giganteus*, *Polyporus squamosus*, *Sarcodontia crocea* [5]	
Atheta sodalis (ERICHSON, 1837)	*Antrodia serialis*, *Bondarzewia mesenterica*, *Climacocystis borealis*, *Daedaleopsis confragosa*, *Laetiporus sulphureus*, *Lenzites betulinus*, *Meripilus giganteus*, *Phaeolus schweinitzii*, *Phlebia rufa*, *Postia stiptica*, *Sarcodontia crocea*, *Trametes suaveolens* [12]	N
Atheta subtilis (SCRIBA, 1866)	*Phaeolus schweinitzii*, *Polyporus badius* [2]	N
Atheta taxiceroides MÜNSTER, 1932	*Meripilus giganteus* [1]	N
Autalia longicornis SCHEERPELTZ, 1947	*Bondarzewia mesenterica*, *Climacocystis borealis*, *Laetiporus sulphureus*, *Meripilus giganteus*, *Sarcodontia crocea* [5]	N
Autalia rivularis (GRAVENHORST, 1802)	*Laetiporus sulphureus*, *Trametes versicolor* [2]	N
Bisnius fimetarius (GRAVENHORST, 1802)	*Laetiporus sulphureus*, *Meripilus giganteus*, *Trametes versicolor* [3]	N
Bisnius puella (NORDMANN, 1837)	*Meripilus giganteus* [1]	N
Bolitochara bella MÄRKEL, 1844	*Trametes versicolor* [1]	N
Bolitochara lucida (GRAVENHORST, 1802)	*Bondarzewia mesenterica*, *Phellinus ferruginosus*, *Polyporus badius*, *Pseudoinonotus dryadeus*, *Pycnoporellus fulgens* [5]	N
Bolitochara obliqua ERICHSON, 1837	*Bjerkandera adusta*, *Climacocystis borealis*, *Coriolopsis troggi*, *Daedaleopsis confragosa*, *Fomes fomentarius*, *Gonoderma applanatum*, *Inonotus hastifer*, *Lenzites betulinus*,	N

1	2	3
	Mensularia nodulosa, *Meripilus giganteus*, *Phlebia rufa*, *Polyporus squamosus*, *Trametes gibbosa* [13]	
Dexiogyia corticina (ERICHSON, 1837)	*Heterobasidion abietinum* [1]	N
Dinaraea aequata (ERICHSON, 1837)	*Sarcodontia crocea* [1]	N
Dochmonota clancula (ERICHSON, 1837)	*Polyporus squamosus* [1]	N
Dropephylla linearis (ZETTERSTEDT, 1828)	*Coriolopsis troggi*, *Pycnoporellus fulgens* [2]	N
Eusphalerum longipenne (ERICHSON, 1839)	*Gloeophyllum sepiarium* [1]	
Gabrius splendidulus (GRAVENHORST, 1802)	*Bjerkandera adusta* [1]	N
Gyrohypnus punctulatus (PAYKULL, 1789)	*Meripilus giganteus* [1]	N
Gyrophaena affinis MANNERHEIM 1830	*Gloeophyllum sepiarium*, *Laetiporus sulphureus*, *Polyporus squamosus* [3]	N
Gyrophaena bihamata THOMSON, 1867	*Gloeophyllum sepiarium*, *Phlebia radiata* [2]	N
Gyrophaena boleti (LINNAEUS, 1758)	*Fomitopsis pinicola*, *F. rosea*, *Ganoderma applanatum*, *Laetiporus sulphureus*, *Phlebia radiata*, *Trametes gibbosa*, *T. suaveolens* [7]	
Gyrophaena fasciata (MARSHAM, 1802)	*Laetiporus sulphureus* [1]	N
Gyrophaena gentilis ERICHSON, 1839	*Gonoderma applanatum*, *Laetiporus sulphureus*, *Phlebia radiata*, *Polyporus badius*, *P. squamosus*, *Trametes gibbosa* [6]	N
Gyrophaena joyi WENDELER, 1924	*Laetiporus sulphureus* [1]	N
Gyrophaena lucidula ERICHSON, 1837	*Daedaleopsis confragosa* [1]	N
Gyrophaena manca ERICHSON, 1839	*Coriolopsis troggi*, *Daedaleopsis confragosa*, *Fomitopsis pinicola*, *Gloeophyllum sepiarium*, *Laetiporus sulphureus*, *Lenzites betulinus*, *Phaeolus schweinitzii*, *Phlebia radiata*, *P. rufa*, *Polyporus badius*, *P. squamosus*, *Pycnoporellus fulgens*, *Sarcodontia crocea*, *Trametes gibbosa*, *T. hirsuta*, *T. suaveolens* [16]	N
Gyrophaena minima ERICHSON, 1837	*Daedaleopsis confragosa*, *Gloeophyllum sepiarium*, *Laetiporus sulphureus*, *Phlebia radiata*, *Phlebia rufa*, *Polyporus badius*, *Trametes gibbosa* [7]	N
Gyrophaena nana (PAYKULL, 1800)	*Trametes gibbosa* [1]	N
Gyrophaena poweri CROTH, 1867	*Bondarzewia mesenterica*, *Gloeophyllum sepiarium*, *Laetiporus sulphureus*, *Lenzites betulinus*, *Meripilus giganteus*, *Polyporus badius*, *Polyporus squamosus*, *Trametes gibbosa* [8]	N

1	2	3
Gyrophaena pulchella HEER, 1839	*Bondarzewia mesenterica* [1]	
Gyrophaena rousi DVOŘAK, 1966	*Gloeophyllum sepiarium*, *Laetiporus sulphureus* [2]	NP
Gyrophaena strictula ERICHSON, 1839	*Gloeophyllum abietinum*, *G. sepiarium*, *Polyporus squamosus*, *Pycnoporellus fulgens*, *Trametes gibbosa* [5]	N
Habrocerus capillaricornis (GRAVENHORST, 1806)	*Meripilus giganteus* [1]	N
Haploglossa villosula (STEPHENS, 1832)	*Phellinus hartigii* [1]	N
Leptusa fumida (ERICHSON, 1839)	*Steccherinum ochraceum* [1]	N
Leptusa pulchella MANNERHEIM 1830	*Trametes hirsuta*, *Xanthoporia radiata* [2]	N
Lordithon bimaculatus (SCHRANK, 1798)	*Bondarzewia mesenterica*, *Ischnoderma benzoinum*, *Laetiporus sulphureus* [3]	N
Lordithon lunulatus (LINNAEUS, 1760)	*Antrodiella mentschulensis*, *Bjerkandera adusta*, *Bondarzewia mesenterica*, *Climacocystis borealis*, *Laetiporus sulphureus*, *Meripilus giganteus*, *Phaeolus schweinitzii*, *Phlebia radiata*, *Polyporus squamosus*, *Sarcodontia crocea*, *Trametes versicolor* [11]	
Lordithon thoracicus (FABRICIUS, 1777)	*Laetiporus sulphureus* [1]	
Lordithon trimaculatus (FABRICIUS, 1793)	*Bjerkandera adusta*, *Meripilus giganteus*, *Trametes gibbosa* [3]	N
Megarthrus denticollis (BECK, 1817)	*Laetiporus sulphureus*, *Postia stiptica* [2]	N
Megarthrus depressus (PAYKULL, 1789)	*Laetiporus sulphureus*, *Meripilus giganteus*, *Phaeolus schweinitzii*, *Polyporus squamosus*, *Sarcodontia crocea* [5]	N
Megarthrus hemipterus (ILLIGER, 1794)	*Climacocystis borealis*, *Phaeolus schweinitzii* [2]	
Megarthrus nitidulus KRAATZ, 1857	*Laetiporus sulphureus* [1]	
Meotica filiformis (MOTSCHULSKY, 1860)	*Trametes versicolor* [1]	N
Neuraphes elongatulus (MÜLLER et KUNZE, 1822)	*Phellinus hartigii* [1]	N
Omalium rivulare (PAYKULL, 1789)	*Daedaleopsis confragosa*, *Meripilus giganteus*, *Trametes versicolor* [3]	
Omalium septentrionis THOMSON, 1857	*Laetiporus sulphureus* [1]	N
Ontholestes tesselatus (GEOFFROY, 1785)	*Meripilus giganteus* [1]	N
Othius punctulatus (GOEZE, 1777)	*Fomitopsis pinicola*, *Ischnoderma benzoinum* [2]	
Oxypoda alternans (GRAVENHORST, 1802)	*Bondarzewia mesenterica*, *Climacocystis borealis*, *Meripilus giganteus*, *Phlebia*	N

1	2	3
	radiata, *Polyporus squamosus*, *Sarcodontia crocea* [6]	
Oxypoda arborea ZERCHE, 1994	*Bondarzewia mesenterica*, *Laetiporus sulphureus*, *Meripilus giganteus* [3]	N
Oxypoda formosa KRAATZ, 1856	*Bondarzewia mesenterica*, *Climacocystis borealis*, *Gloeophyllum sepiarium*, *Laetiporus sulphureus*, *Phlebia radiata*, *Polyporus badius*, *P. squamosus*, *Trametes gibbosa*, *Trichaptum abietinum* [9]	N
Oxyporus maxillosus FABRICIUS, 1793	*Laetiporus sulphureus* [1]	N
Philonthus addendus SHARP, 1867	*Meripilus giganteus* [1]	
Philonthus marginatus (O.MÜLLER, 1764)	*Meripilus giganteus* [1]	N
Philonthus succicola THOMSON, 1860	*Meripilus giganteus* [1]	N
Philonthus tenuicornis MULSANT & REY, 1853	*Laetiporus sulphureus*, *Meripilus giganteus* [2]	N
Phloeocharis subtilissima MANNERHEIM 1830	*Daedaleopsis confragosa*, *Fomitopsis pinicola*, *Mensularia nodulosa*, *Phellinus hartigii*, *Pycnoporellus fulgens*, *Trametes versicolor* [6]	N
Phloeonomus punctipennis THOMSON, 1867	*Trichaptum abietinum* [1]	
Phloeonomus pusillus (GRAVENHORST, 1806)	*Trametes suaveolens* [1]	N
Phloeonomus sjobergi STRAND, 1937	*Polyporus badius*, *Trametes gibbosa* [2]	N
Phyllodrepa nigra (GRAVENHORST, 1806)	*Meripilus giganteus* [1]	N
Phymatura brevicollis (KRAATZ, 1856)	*Fomitopsis pinicola*, *Laetiporus sulphureus*, *Meripilus giganteus*, *Trametes gibbosa* [4]	
Proteinus atomarius ERICHSON, 1840	*Phaeolus schweinitzii* [1]	N
Proteinus brachypterus (FABRICIUS, 1792)	*Bondarzewia mesenterica*, *Climacocystis borealis*, *Laetiporus sulphureus*, *Meripilus giganteus* [4]	
Proteinus crenulatus PANDELLÉ, 1867	*Antrodiella mentschulensis*, *Bondarzewia mesenterica*, *Climacocystis borealis*, *Meripilus giganteus*, *Postia stiptica*, *Sarcodontia crocea* [6]	
Proteinus laevigatus HOCHHUTH, 1872	*Climacocystis borealis*, *Laetiporus sulphureus* [2]	N
Quedius cinctus (PAYKULL, 1790)	*Meripilus giganteus* [1]	N
Quedius lateralis (GRAVENHORST, 1802)	*Bondarzewia mesenterica* [1]	N
Quedius lucidulus ERICHSON, 1839	*Meripilus giganteus* [1]	
Quedius maurus (SAHLBERG, 1830)	*Meripilus giganteus* [1]	N

1	2	3
Quedius mesomelinus mesomelinus (MARSHAM, 1802)	*Meripilus giganteus*, *Pseudoinonotus dryadeus* [2]	N
Quedius plagiatus MANNERHEIM, 1843	*Trametes gibbosa* [1]	N
Quedius xanthopus ERICHSON, 1839	*Antrodia serialis*, *Ischnoderma benzoinum*, *Meripilus giganteus* [3]	N
Rugilus rufipes GERMAR, 1836	*Laetiporus sulphureus*, *Trametes versicolor* [2]	
Scaphidium quadrimaculatum OLIVIER, 1790	*Fomitopsis pinicola*, *Sarcodontia crocea* [2]	
Scaphisoma agaricinum (LINNAEUS, 1758)	*Laetiporus sulphureus*, *Phlebia rufa*, *Phylloporia ribis*, *Polyporus squamosus*, *Sarcodontia crocea*, *Skeletocutis carneogrisea* [6]	N
Scaphisoma boleti (PANZER, 1793)	*Laetiporus sulphureus*, *Sarcodontia crocea*, *Trametes gibbosa* [3]	N
Scaphisoma boreale LUNDBLAD, 1959	*Gonoderma applanatum*, *Phellinus hartigii* [2]	N
Scaphisoma obenbergeri LÖBL I., 1963	*Laetiporus sulphureus* [1]	N
Scaphisoma subalpinum REITTER, 1880	*Polyporus squamosus* [1]	N
Sepedophilus testaceus (FABRICIUS, 1758)	*Gonoderma applanatum*, *Phellinopsis conchata* [2]	N
Staphylinus erythropterus LINNAEUS, 1758	*Steccherinum fimbriatum* [1]	N
Stenus humilis ERICHSON, 1839	*Sarcodontia crocea* [1]	N
Tachinus humeralis GRAVENHORST, 1802	*Meripilus giganteus* [1]	N
Tachinus laticollis GRAVENHORST, 1802	*Climacocystis borealis*, *Meripilus giganteus*, *Phaeolus schweinitzii* [3]	
Tachinus pallipes (GRAVENHORST, 1806)	*Laetiporus sulphureus*, *Meripilus giganteus*, *Phaeolus schweinitzii* [3]	N
Tachinus subterraneus (LINNAEUS, 1758)	*Laetiporus sulphureus*, *Meripilus giganteus* [2]	
Xylostiba monilicornis (GYLLENHAL, 1810)	*Bondarzewia mesenterica*, *Climacocystis borealis*, *Meripilus giganteus* [3]	N
Geotrupidae [1]		
Anoplotrupes stercorosus (SCRIBA, 1791)	*Climacocystis borealis*, *Meripilus giganteus* [2]	N
Lucanidae [2]		
Ceruchus chrysomelinus (HOCHENWARTH, 1785)	*Pycnoporellus fulgens* [1]	
Sinodendron cylindricum (LINNAEUS, 1758)	*Trametes versicolor* [1]	

1	2	3
Byrrhidae [1]		
Byrrhus luniger (GERMAR, 1817)	*Oxyporus ravidus* [1]	N
Derodontidae [1]		
Derodontus macularis (FUSS, 1850)	*Ischnoderma benzoinum* [1]	
Ptinidae [1]		
Dorcatoma punctulata MULSANT & REY, 1864	*Fomitopsis pinicola* [1]	N
Trogossitidae [2]		
Peltis ferruginea (LINNAEUS, 1758)	*Antrodia serialis*, *Antrodia sinuosa*, *Fomitopsis pinicola*, *Postia caesia* [4]	N
Thymalus limbatus (FABRICIUS, 1787)	*Polyporus squamosus* [1]	
Nitidulidae [6]		
Cyllodes ater (HERBST, 1792)	*Bjerkandera adusta*, *Laetiporus sulphureus* [2]	N
Epuraea sp.	*Antrodia serialis*, *Antrodiella mentschulensis*, *Bjerkandera adusta*, *Daedaleopsis confragosa*, *Fomes fomentarius*, *Fomitopsis pinicola*, *Laetiporus sulphureus*, *Phlebia radiata*, *Polyporus squamosus*, *Pycnoporellus fulgens*, *Trametes gibbosa*, *T. suaveolens*, *T. versicolor*, *Xanthoporia radiata* [14]	
Meligethes sp.	*Bjerkandera adusta* [1]	
Omosita depressa (LINNAEUS, 1758)	*Bondarzewia mesenterica* [1]	N
Pocadius adustus REITTER, 1888	*Laetiporus sulphureus*, *Polyporus squamosus* [2]	N
Pocadius ferrugineus (FABRICIUS, 1775)	*Laetiporus sulphureus*, *Phellinus igniarius*, *Polyporus squamosus*, *Xanthoporia radiata* [4]	N
Monotomidae [2]		
Rhizophagus bipustulatus (FABRICIUS, 1792)	*Bjerkandera adusta*, *Sarcodontia crocea*, *Xanthoporia radiata* [3]	
Rhizophagus dispar (PAYKULL, 1800)	*Bondarzewia mesenterica*, *Fomes fomentarius*, *Fomitopsis betulina*, *F. pinicola*, *Ganoderma applanatum*, *Ischnoderma benzoinum*, *Mensularia nodulosa*, *Polyporus squamosus*, *Xanthoporia radiata* [9]	
Cryptophagidae [3]		
unidentified	*Fomitopsis pinicola*, *F. rosea* [2]	
Atomaria sp.	*Antrodia sinuosa*, *Fomitopsis pinicola*, *Meripilus giganteus*, *Pycnoporellus fulgens*, *Xanthoporia radiata* [5]	
Cryptophagus sp.	*Antrodia serialis*, *Bondarzewia mesenterica*, *Gonoderma applanatum*, *Inonotus cuticularis*, *Laetiporus sulphureus*, *Meripilus giganteus*, Polyporoidalny [7]	

1	2	3
Pteryngium crenatum (FABRICIUS, 1798)	*Fomitopsis pinicola*, *Pycnoporellus fulgens* [2]	
Silvanidae [1]		
Uleiota planatus (LINNAEUS, 1761)	*Sarcodontia crocea* [1]	N
Cucujidae [1]		
Pediacus dermestoides (FABRICIUS, 1792)	*Polyporus squamosus* [1]	N
Erotylidae [1]		
Dacne rufifrons (FABRICIUS, 1775)	*Bjerkandera adusta* [1]	N
Cerylonidae [3]		
Cerylon fagi BRISOUT, 1867	*Trametes gibbosa* [1]	N
Cerylon ferrugineum STEPHENS, 1830	*Ischnoderma benzoinum*, *Mensularia nodulosa*, *Polyporus squamosus*, *Xanthoporia radiata* [4]	
Cerylon histeroides (FABRICIUS, 1792)	*Gonoderma applanatum*, *Ischnoderma benzoinum*, *Trametes gibbosa*, *T. versicolor*, *Xanthoporia radiata* [5]	
Endomychidae [1]		
Mycetina cruciata (SCHALLER, 1783)	*Gonoderma applanatum*, *Polyporus squamosus* [2]	N
Corylophidae [3]		
Orthoperus corticalis (REDTENBACHER, 1849)	*Laetiporus sulphureus*, *Phlebia radiata* [2]	N
Orthoperus rogeri KRAATZ, 1874	Polyporoidalny, *Polyporus squamosus*, *Pycnoporellus fulgens*, *Trametes gibbosa* [4]	N
Sericoderus lateralis (GYLLENHAL, 1827)	*Polyporus squamosus* [1]	N
Latridiidae [4]		
unidentified	*Fomitopsis pinicola*, *Phellinopsis conchata*, *Postia caesia*, *Trametes pubescens* [4]	
Cartodere nodifer (WESTWOOD, 1839)	*Fomes fomentarius*, *Laetiporus sulphureus*, *Polyporus squamosus*, *Sarcodontia crocea* [4]	
Dienerella vincenti JOHNSON, 2007	*Polyporus squamosus* [1]	N
Stephostethus angusticollis (GYLLENHAL, 1827)	*Xanthoporia radiata* [1]	N
Ciidae [16]		
Cis bidentatus (OLIVIER, 1790)	*Cystostereum murrayi*, *Fomitopsis betulina*, *Inonotus cuticularis*, *Polyporus squamosus* [4]	N
Cis boleti (SCOPOLI, 1763)	*Trametes gibbosa*, *T. versicolor* [2]	
Cis castaneus (HERBST, 1793)	*Daedaleopsis confragosa*, *Ganoderma applanatum*, *G. carnosum*, *Ischnoderma benzoinum*, *Podofomes trogii*, *Polyporus badius*, *Trametes gibbosa*, *T. versicolor* [8]	

1	2	3
Cis dentatus MELLIÉ, 1849	*Antrodia serialis*, *Fomitopsis pinicola*, *F. rosea*, *Ischnoderma benzoinum* [4]	
Cis fissicornis MELLIÉ, 1849	*Trametes versicolor* [1]	N
Cis glabratus MELLIÉ, 1849	*Fomes fomentarius*, *Fomitopsis pinicola*, *F. rosea*, *Polyporus squamosus*, *Pycnoporellus fulgens* [5]	
Cis jacquemartii MELLIÉ, 1848	*Ganoderma applanatum*, *Polyporus badius*, *Fomes fomentarius* [3]	N
Cis micans (FABRICIUS, 1792)	*Trametes versicolor* [1]	N
Cis quadridens MELLIÉ, 1849	*Fomitopsis pinicola*, *Pycnoporellus fulgens* [2]	N
Cis submicans ABEILLE DE PERRIN, 1874	*Trametes gibbosa*, *T. versicolor* [2]	N
Cis villosulus (MARSHAM, 1802)	*Trametes hirsuta* [1]	N
Ennearthron cornutum (GYLLENHAL, 1827)	*Dichomitus campestris*, *Oxyporus ravidus*, *Phellinus punctatus*, *Phylloporia ribis*, *Podofomes trogii*, *Trichaptum abietinum* [6]	N
Octotemnus glabriculus (GYLLENHAL, 1827)	*Laetiporus sulphureus*, *Lenzites betulinus*, *Trametes gibbosa*, *T. hirsuta*, *T. pubescens*, *T. suaveolens*, *T. versicolor* [7]	N
Octotemnus mandibularis (GYLLENHAL, 1813)	*Trametes pubescens* [1]	N
Sulcacis fronticornis (PANZER, 1806)	*Lenzites betulinus*, *Trametes hirsuta* [2]	N
Sulcacis nitidus (FABRICIUS, 1792)	*Trametes hirsuta*, *Trametes suaveolens* [2]	N
Mycetophagidae [5]		
Litargus connexus (FOURCROY, 1785)	*Xanthoporia radiata* [1]	N
Mycetophagus ater (REITTER, 1879)	*Bjerkandera adusta*, *Phlebia rufa*, *Polyporus squamosus* [3]	N
Mycetophagus multipunctatus FABRICIUS, 1792	*Polyporus squamosus*, *Xanthoporia radiata* [2]	N
Mycetophagus quadripustulatus (LINNAEUS, 1760)	*Bjerkandera adusta*, *Polyporus squamosus*, *Xanthoporia radiata* [3]	N
Triphyllus bicolor (FABRICIUS, 1792)	*Polyporus squamosus* [1]	N
Melandryidae [2]		
Abdera flexuosa (PAYKULL, 1799)	*Xanthoporia radiata* [1]	N
Orchesia undulata KRAATZ, 1853	*Phlebia rufa* [1]	N
Tetratomidae [4]		
Hallomenus axillaris (ILLIGER, 1807)	*Pycnoporellus fulgens* [1]	N
Hallomenus binotatus (QUENSEL, 1790)	*Bondarzewia mesenterica*, *Dacryobolus karstenii*, *Laetiporus sulphureus*, *Phaeolus schweinitzii*, *Polyporus squamosus* [4]	
Mycetoma suturale (PANZER, 1797)	*Ischnoderma benzoinum*, *Ischnoderma resinosum* [2]	
Tetratoma fungorum FABRICIUS, 1790	*Inonotus cuticularis* [1]	N

1	2	3
Tenebrionidae [3]		
Bolitophagus reticulatus (LINNAEUS, 1767)	*Fomes fomentarius*, *Ganoderma applanatum*, *Trametes gibbosa* [3]	
Eledona agricola (HERBST, 1783)	*Laetiporus sulphureus* [1]	N
Scaphidema metallica (FABRICIUS, 1792)	*Phylloporia ribis* [1]	N
Chrysomelidae [3]		
Batophila rubi (PAYKULL, 1799)	*Laetiporus sulphureus* [1]	
Hermaeophaga mercurialis (FABRICIUS, 1792)	*Laetiporus sulphureus*, *Trametes gibbosa* [2]	N
Mniophila muscorum (KOCH, 1803)	*Gloeophyllum odoratum* [1]	N
Curculionidae [3]		
Acalles sp.	*Gonoderma applanatum* [1]	
Rhyncolus elongatus (GYLLENHAL, 1827)	*Trichaptum abietinum* [1]	
Trachodes hispidus (LINNAEUS, 1758)	*Trametes pubescens* [1]	

hovewer, only a single specimen was observed. Altogether, 194 species were present, classified in 29 families (Tab. 4). Rove beetles were the most abundant, both in number of specimens (84.87%) and number of species (58.76%). The second most common family was Ciidae (8.37% of specimens and 8.25% of species). Remaining 27 families were represented by 6.76% of specimens and 33% of species. Staphylinidae and Ciidae were the families richest in species with 114 and 16 species respectively. Over 23% (47) of species were collected in single specimen only. About 32.7% (66) of species were collected on a single species of fungus, and only 2.9% (6) were collected on 10 or more species of fungi. The number of beetle species recorded from particular species of fungi varied significantly. Fruiting bodies of *Laetiporus sulphureus* were inhabited by 66 species of beetles. *Meripilus giganteus* was only slightly less attractive, with 59 species of beetles collected, 44 species of beetles were collected on *Polyporus squamosus*, 33 on *Trametes gibbosa*, and 27 on *Bondarzewia mesenterica*. Fruiting bodies of 13 species of fungi were inhabited by a single species of beetle only.

21 or more species of beetles were collected on only 7 species of fungi (11.7%), and in most cases (32 species, 53.3%) only 5 species or less was collected on a particular species of fungus.

Table 4. List of families of beetles collected on polyporoid fungi in Pieniny NP (sorted according to number of records)

Lista rodzin chrząszczy zebranych na grzybach poliporoidalnych w Pienińskim PN (rodziny z największą liczbą stwierdzeń na początku)

Family Rodzina	Number of records including members of the family Liczba rekordów zawierających przedstawicieli rodziny	Total number of specimens (% of all specimens) Łączna liczba okazów (% wszystkich okazów)	Number of identified species (% of all species) Liczba oznaczonych gatunków (% wszystkich gatunków)	Number of species of fungi associated with particular family Liczba gatunków grzybów związanych w określoną rodziną	visitor (V) (including saprotrophic species) / mycophagous (M) Gatunek odwiedzający (V) (w tym gatunki saprotroficzne) / mykofag (M)
1	2	3	4	5	6
Staphylinidae	575	5565 (84.87)	114 (58.76)	46	M/V
Ciidae	102	549 (8.37)	16 (8.25)	28	M
Nitidulidae	34	77 (1.17)	4 (2.06)	16	M/V
Tetratomidae	18	93 (1.42)	4 (2.06)	9	M
Cryptophagidae	18	38 (0.58)	1 (0.52)	11	M
Leiodidae	16	24 (0.37)	10 (5.15)	11	M/V
Mycetophagidae	13	28 (0.43)	5 (2.58)	4	M
Monotomidae	13	21 (0.32)	2 (1.03)	11	V
Cerylonidae	11	12 (0.18)	3 (1.55)	7	M/V
Latridiidae	10	16 (0.24)	3 (1.55)	9	M
Corylophidae	8	9 (0.14)	3 (1.55)	6	M
Tenebrionidae	8	18 (0.27)	3 (1.55)	5	M
Histeridae	5	11 (0.17)	3 (1.55)	2	V
Melandryidae	5	7 (0.11)	2 (1.03)	2	M
Trogossitidae	5	16 (0.24)	2 (1.03)	5	M/V
Derodontidae	5	13 (0.20)	1 (0.52)	1	M
Chrysomelidae	4	4 (0.06)	3 (1.55)	3	V
Hydrophilidae	4	29 (0.44)	1 (0.52)	1	V
Curculionidae	3	3 (0.05)	2 (1.03)	3	V

1	2	3	4	5	6
Silphidae	3	3 (0.05)	2 (1.03)	3	V
Geotrupidae	3	7 (0.11)	1 (0.52)	2	V
Lucanidae	2	2 (0.03)	2 (1.03)	2	V
Endomychidae	2	3 (0.05)	1 (0.52)	2	M
Ptiliidae	2	5 (0.08)	1 (0.52)	2	V
Ptinidae	1	3 (0.05)	1 (0.52)	1	M
Byrrhidae	1	1 (0.02)	1 (0.52)	1	V
Cucujidae	1	3 (0.05)	1 (0.52)	1	V
Erotylidae	1	1 (0.02)	1 (0.52)	1	M
Silvanidae	1	1 (0.02)	1 (0.52)	1	V
	873	6557	194	60	

Among the collected species, 32 (on 134 localities) require special attention (Figs 3, 4). Five of them (*Atheta paracrassicornis*, *Atheta taxiceroides*, *Autalia longicornis*, *Lordithon bimaculatus*, *Oxypoda arborea*) have only recently been recorded from Poland and are known from a very low number of localities. The following species are included in Polish Red List of Animals (PAWŁOWSKI & al. 2002): *Bisnius puella* – near threatened, *Derodontus macularis* – data deficient, *Mycetoma suturale* – near threatened, *Mycetophagus ater* – endangered, *Scaphisoma boreale* – vulnerable, *Octotemnus mandibularis* – extinct (?). Several species are very rarely recorded in Poland: *Agaricochara latissima*, *Atheta excelsa*, *Atheta liturata*, *Cis fissicornis*, *Colenis immunda*, *Gyrophaena minima*, *Hallomenus axilaris, Megarthrus hemipterus, Meotica filiformis*, *Orthoperus rogeri*, *Oxypoda formosa*, *Phloeonomus sjobergi*, *Proteinus crenulatus, Pteryngium crenatum*, *Scaphisoma subalpinum,* and *Thymalus limbatus*. *Gyrophaena rousi* is newly recorded in Poland. Some of the recorded species are relics of natural forests (PAWŁOWSKI 2008, KOMOSIŃSKI 2013, SZUJECKI 2017), including *Acrulia inflata*, *Lordithon trimaculatus*, *Mycetophagus ater, Phymatura brevicollis, Xylostiba monilicornis*. Localities of the abovementioned species are shown on maps (Figs 3, 4). The most interesting species are briefely mentioned below, where detailed locality data is reported. For data on remaining species, see Appendices (CHACHUŁA & al. 2018c).

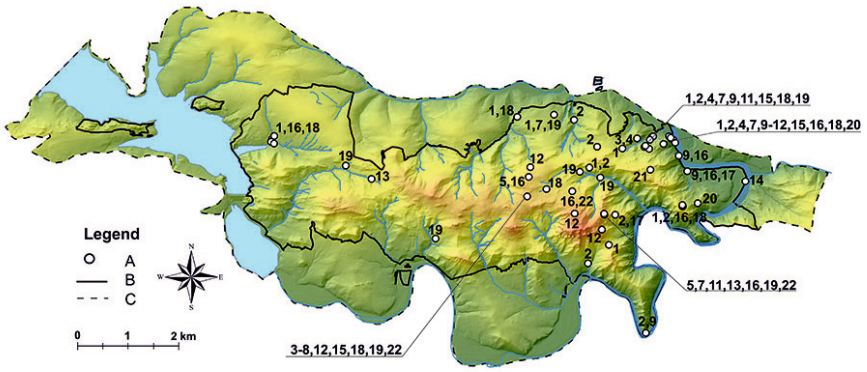

Fig. 3. Localization of rare and endangered species of Staphylinidae catched on the polyporoid fungi in the Pieniny National Park. Marks: **A –** localization of the study site, **B** – border of the national park, **C** – buffer zone of the national park, 1 – *Acrulia inflata*, 2 – *Agaricochara latissima*, 3 – *Atheta excelsa*, 4 – *Atheta liturata*, 5 – *Atheta paracrassicornis,* 6 – *Atheta taxiceroides*, 7 – *Autalia longicornis*, 8 – *Bisnius puella.* 9 – *Gyrophaena minima*, 10 – *Gyrophaena rousi*, 11 – *Lordithon bimaculatus*, 12 – *Lordithon trimaculatus*, 13 – *Megarthrus hemipterus*, 14 – *Meotica filiformis*, 15 – *Oxypoda arborea*, 16 – *Oxypoda formosa*, 17 – *Phloeonomus sjobergi*, 18 – *Phymatura brevicollis*, 19 – *Proteinus crenulatus*, 20 – *Scaphisoma boreale*, 21 – *Scaphisoma subalpinum*, 22 – *Xylostiba monilicornis*.

Lokalizacja stanowisk rzadkich i zagrożonych Staphylinidae na obszarze Pienińskiego Parku Narodowego. Oznaczenia: **A** – stanowiska, **B** – granica parku, **C** – otulina.

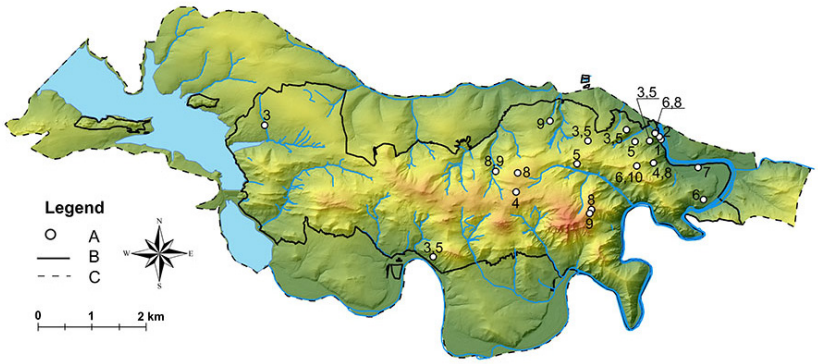

Fig. 4. Localization of rare and endangered species of other families catched on the polyporoid fungi in the Pieniny National Park. Marks: **A –** localization of the study site, **B** – border of the national park, **C** – buffer zone of the national park, 1 – *Cis fissicornis*, 2 – *Colenis immunda*, 3 – *Derodontus macularis*, 4 – *Hallomenus axillaris*, 5 – *Mycetoma suturale*, 6 – *Mycetophagus ater,* 7 – *Octotemnus mandibularis*, 8 – *Orthoperus rogeri*, 9 – *Pteryngium crenatum*, 10 – *Thymalus limbatus*.

Lokalizacja stanowisk rzadkich i zagrożonych chrząszczy z pozostałych rodzin na obszarze Pienińskiego Parku Narodowego. Oznaczenia: **A** – stanowiska, **B** – granica parku, **C** – otulina.

Selected rare and interesting Coleoptera.

Atheta excelsa BERNHAUER, 1911 (Staphylinidae, Aleocharinae)

A very rare boreo-alpine species, known in Poland from two records in the northern part of the country (SMOLEŃSKI 2000, KOMOSIŃSKI & PALIŃSKA 2006), Tatry Mts. (TENENBAUM 1929), and Babia Góra Mt. (MELKE & SZAFRANIEC 2003).

New records in Pieniny NP:

– Sowie Skałki, 27 VII 2017, 5 exx., 611 m a.s.l., 2 dead fruiting bodies of *Inonotus cuticularis* on *Fagus sylvatica* in termophilous beech forest, together with *Cis bidentatus* 3 exx., *Atheta picipes* 3 exx., *Atheta crassicornis* 1 ex.;
– Wielka Dolina, 16 X 2017, 2 exx., 796 m a.s.l., numerous rotting fruiting bodies of *Meripilus giganteus* on *Fagus sylvatica,* beech-fir forest, together with 523 exx. of Staphylinidae.

Atheta taxiceroides MÜNSTER, 1932 (Staphylinidae, Aleocharinae)

A boreo-alpine species recorded in Poland from Białowieża Forest (on the basis of a single specimen only, see BOROWIEC 1991) and from a doubtful, general record from Beskidy Mts. (HORION 1951). Wider distributed in Pieniny Mts. (unpublished data on non-polyporoid fungi).

A new record in Pieniny NP:

– Wielka Dolina, 26 XI 2017, 5 exx., 796 m a.s.l., numerous rotting fruiting bodies of *Meripilus giganteus* on *Fagus sylvatica,* beech-fir forest, together with 21 exx. of 7 species of Staphylinidae.

Scaphisoma boreale LUNDBLAD, 1959 (Staphylinidae, Scaphidiinae)

According to published records it is a very rare species in Poland, known from northern part of the country (i.a. Białowieża Forest) and scattered localities in mountains. It inhabits tree-growing fungi. Due to its rarity and habitat preferences it is listed on a Polish Red List of Coleoptera (PAWŁOWSKI & al. 2002). It has been recently recorded in natural forests of Karpaty Forest (BUCHHOLZ & MELKE 2018). Unpublished data suggest that species is more common in Poland.

New records in Pieniny NP:

– Pajówka, 16 V 2017, 2 exx., 433 m a.s.l., fruiting body of *Ganoderma applanatum* on *Salix* sp., together with *Mycetina cruciata*, 2 exx.

– Masyw Sokolicy, 18 VI 2016, 1 ex., 557 m a.s.l., 2 fresh sporocarps of *Phellinus hartigii* on *Abies alba,* beech-fir forest with *Corylus avellana*, together with *Haploglossa villosula* 1 ex., *Phloeocharis subtilissima* 1 ex.

Gyrophaena rousi DVOŘAK, 1966 (Staphylinidae, Aleocharinae)

Species newly recorded in Poland, three specimens were collected, with no accompanying species. A separate paper on *Gyrophaena rousi* is in preparation.

New records in Pieniny NP:

– Pajówka, 25 VI 2017 (49°25'47.6"; 20°26'20.3"), 1 ex., 432 m a.s.l., few fresh sporocarps of *Gloeophyllum sepiarium* on coniferous tree;
– Pajówka, 25 VI 2017 (49°25'47.6"; 20°26'20.3"), 2 exx., 432 m a.s.l., 7 mature sporocarps of *Laetiporus sulphureus* on *Salix* sp.

Phloeonomus sjobergi STRAND, 1937 (Staphylinidae, Omaliinae)

A boreo-alpine species, in Poland known from two localities only: Bieszczady Mts. (Tarnawa Wyżna, ca. 750 m a.s.l.), where a single specimen was collected under bark of a spruce infested by *Ips typographus* and *Tetropium* sp. (SZUJECKI 1987, 1996), and from Pogórze Przemyskie (Góra Kanasin, Las Karaszyn, Jureczkowa), where a few specimens were collected in barrier traps and under bark of a fir (BUCHHOLZ & MELKE 2018).

New records in Pieniny NP:

– Pajówka, 25 VI 2017, 1 ex., 428 m a.s.l., three mature sporocarps of *Polyporus badius* on *Salix* sp., edge of beech-fir forest, together with 7 species of Staphylinidae (44 exx.) and *Cis castaneus* (2 exx.).
– Ligarki, 2 X 2016, 1 ex., 750 m a.s.l., dry sporocarps of *Trametes gibbosa* on *Fagus sylvatica*, beech-fir forest with hazel trees, together with 22 exx. of *Agaricochara latissima* and 5 exx. of *Octotemnus glabriculus*.

Meotica filiformis (MOTSCHULSKY, 1860) (Staphylinidae, Aleocharinae)

Due to their small body size and large number of species, the genus *Meotica* MULSANT et REY is poorly studied and insufficiently known. It is very likely that *M. filiformis* is not a rare species in Poland, even though it has only recently been recorded in the country (RENNER & MESSUTAT 2007). It was also found in Kampinos Forest (MARCZAK & al. 2012) both

in pitfall and flight interception traps (unpublished data). It is probably a saproxylic species, associated with tree-growing fungi.

A new record in Pieniny NP:

– Za Piecem (49°25'22.3"; 20°27'29.1"), 21 V 2017, 1 ex., 481 m a.s.l., *Trametes versicolor,* several dozen dead basidiocarps on *Salix* sp., riparian forest, together with 24 beetles including 8 species of Staphylinidae and 2 species of Leiodidae.

Derodontus macularis (FUSS, 1850) (Derodontidae)

A rare species associated with both species of *Ischnoderma* occurring in Poland.

New records in Pieniny NP:

– Stolarzówka (49°25'44.7"; 20°25'11"), 11 XI 2016, 2 exx., 652 m a.s.l., *Ischnoderma benzoinum,* 2 mature basidiocarps on *Abies alba,* area of isolated trees, beech-fir forest with sycamore;
– Macelowa Góra Mt. (49°24'30.3"; 20°22'41.5"), 12 XI 2016, 2 exx., 533 m a.s.l., small pine woods (*Pinus sylvestris*-*Calamagrostis varia*) on *Ischnoderma benzoinum,* 1 alive basidiocarp on *Abies alba,* part beech-fir, spruce in pine forest;
– Ociemny Wierch Mt. (49°25'44.99"; 20°26'10.9"), 21 XI 2016, 1 ex., 537 m a.s.l., *Ischnoderma benzoinum,* 3 mature basidiocarps on *Abies alba*, beech-fir forest with sycamore;
– Sowie Skałki Mt. (49°25'51.9"; 20°25'48.4"), 23 XI 2016, 1 ex., 563 m a.s.l., *Ischnoderma benzoinum*, 3 mature basidiocarps on *Abies alba,* beech-fir forest;
– Harczygrunt (49°25'50.1"; 20°20'03.1"), 9 IV 2017, 7 exx., 611 m a.s.l., *Ischnoderma benzoinum,* few dead basidiocarps on *Abies alba,* fir forest with spruce.

Cis fissicornis MELLIÉ, 1849 (Ciidae)

One of the rarest members of the family in Poland, known from only a few localities in Poland, mostly based on old findings (KUBISZ & al. 2015).

A new record in Pieniny NP:

– Pajówka (49°25'45.86"; 20°26'22.1"), 16 V 2017, 2 exx., 432 m a.s.l., *Trametes versicolor,* few fresh basidiocarps on *Salix* sp., riparian forest.

Octotemnus mandibularis (GYLLENHAL, 1813) (Ciidae)

In the Polish Red List of Animals (PAWŁOWSKI & al. 2002) *O. mandibularis* is listed as probably extinct. The species was rediscovered in Poland by BOROWSKI & SZCZEPKOWSKI (2011). Another locality was reported by BOROWSKI & SZCZEPKOWSKI (2018). The cited authors suggested that the species is monophagous on *Trametes pubescens*.

A new record in Pieniny NP:

– Kras (49°25'28.3"; 20°26'58.2"), 5 IV 2017, 6 exx., 434 m a.s.l., *Trametes pubescens*, 10 dry basidiocarps on *Corylus avellana*, riparian forest.

Mycetophagus ater (REITTER, 1879) (Mycetophagidae)

A rare representative of the family, usually collected in well preserved, natural forests. It has been collected more often recently which may be either a result of growing interest in beetles associated with fungi or expansion of the species. Recent records were reported by RUTA & al. (2012) and ROSSA & al. (2018).

New records in Pieniny NP:

– Młaka Pod Ociemnem (49°25'49.9"; 20°26'16.1"), 16V 2017, 1 ex., 440 m a.s.l., *Bjerkandera adusta,* several dozen fresh basidiocarps on *Carpinus betulus*, fir-linden and spruce-hornbeam forest;
– Za Piecem (49°25'07.9"; 20°27'03.8"): 3 VIII 2017 2 exx., 5 VIII 2017, 1 ex., 466 m a.s.l., *Phlebia rufa*, few mature basidiocarps on *Malus domestica*, apple orchard.

Mycetoma suturale (PANZER, 1797) (Tetratomidae)

An interesting species restricted to natural forests, where it develops on fruiting bodies of *Ischnoderma* spp. It was recorded in Pieniny NP by BURAKOWSKI (1995).

New records in Pieniny NP:

– Ociemny Potok (49°25'44.4"; 20°25'56.8"), 11 XI 2016, 3 exx., 539 m a.s.l., *Ischnoderma resinosum,* 1 mature basidiocarp on *Fagus sylvatica*, beech-fir forest;
– Białe Skałki Mt. (49°25'30.1"; 20°25'00.6"), 15 X 2016, 5 exx., 694 m a.s.l., *Ischnoderma resinosum*, fresh basidiocarp on *Fagus sylvatica*, old fir-beech forest;
– Ociemny Wierch Mt. (49°25'44.99"; 20°26'10.9"), 21 XI 2016, 4 exx., 537 m a.s.l., *Ischnoderma benzoinum,* 3 mature basidiocarps on *Abies alba*, beech-fir forest with sycamore;

– Sowie Skałki Mt. (49°25'51.9"; 20°25'48.4"), 23 XI 2016, 19 exx., 563 m a.s.l., *Ischnoderma benzoinum*, 3 mature basidiocarps on *Abies alba,* beech-fir forest;
– Białe Skałki Mt. (49°25'30.1"; 20°25'00.6"), 15 X 2016, 30 exx., 694 m a.s.l., *Ischnoderma benzoinum*, 4 mature basidiocarps on *Fagus sylvatica*, old beech-fir forest;
– Kosarzyska (49°25'0.9"; 20°25'15"), 2 X 2016, 4 exx., 810 m a.s.l., *Ischnoderma benzoinum,* 2 mature basidiocarps, dry with grub on *Abies alba*, beech-fir forest;
– Macelowa Góra Mt. (49°24'30.3"; 20°22'41.5"), 12 XI 2016, 1 ex., small pine woods (*Pinus sylvestris-Calamagrostis varia*) on 533 m a.s.l., *Ischnoderma benzoinum,* 1 alive basidiocarp on *Abies alba,* part beech-fir, spruce in pine forest;
– Stolarzówka (49°25'44.7"; 20°25'11"), 11 XI 2016, 2 exx., 652 m a.s.l., *Ischnoderma benzoinum,* 2 mature basidiocarps on *Abies alba,* area of isolated trees, beech-fir forest with sycamore.

Orthoperus rogeri KRAATZ, 1874 (Corylophidae)

A rare species with poorly known habitat preferences. Recent records were reported by RUTA & al. (2010).

New records in Pieniny NP:
– Młaka Pod Ociemnem (49°25'49.85"; 20°26'16.15"), 18 V 2017, 2 exx., 440 m a.s.l., *Trametes gibbosa*, few fresh basidiocarps on *Carpinus betulus*, fir-linden and spruce-hornbeam forest;
– Burzana (49°25'30.9"; 20°26'14.9"), 29 VII 2017, 1 ex., 625 m a.s.l., *Pycnoporellus fulgens*, fresh basidiocarp, 2 young basidiocarps on *Abies alba*, beech-fir forest;
– Kosarzyska (49°25'1.1"; 20°25'14.88"), 2 X 2016, 1 ex., 812 m a.s.l., unidentified polyporoid fungus*,* 1 fresh basidiocarp on *Albies alba*, beech-fir forest;
– Zagroń (49°25'24.85"; 20°23'41.6"), 3 V 2017, 1 ex., 655 m a.s.l., *Pycnoporellus fulgens,* 4 dead basidiocarps on *Abies alba*, old beech-fir forest;
– Mała Dolina (49°25'23.9"; 20°24'02.9"), 24 VI 2017, 1 ex., 808 m a.s.l., *Polyporus squamosus,* 6 dry and dead basidiocarps on *Fagus sylvatica,* old beech forest.

Pteryngium crenatum (FABRICIUS, 1798) (Cryptophagidae)

A rare species usually collected on tree-growing fungi. Recorded from scattered localities in Poland, restricted to well preserved, natural forests. According to BOROWSKI & al. (2013) it is associated with sporocarps of *Fomitopsis pinicola.* Recent records in Poland are reported in JAŁOSZYŃSKI & al. (2015).

New records in Pieniny NP:

– Trzy Korony Mt. (49°24'58.7"; 20°25'13.2"), 31 V 2016, 2 exx., 815 m a.s.l., on fresh basidiocarp of *Fomitopsis pinicola* on *Abies alba* in beech-fir forest;
– Wielkie Załonie (49°23'57"; 20°24'3.9"), 13 VII 2016, 16 exx., 550 m a.s.l., mature basidiocarps of *Fomitopsis pinicola* on *Abies alba*, beech-fir forest;
– Zagroń (49°25'24.85"; 20°23'41.6"), 3V 2017, 5 exx., 655 m a.s.l., 4 dead basidiocarps of *Pycnoporellus fulgens* on *Abies alba*, old beech-fir forest.

Until now, 1590 species of beetles have been recorded in the Pieniny National Park (KNUTELSKI & KNUTELSKA 2014). As a result of the presented survey, 148 species were reported as new for the Pieniny Mts. and one species is newly recorded in Poland.

Discussion

Host preferences of beetles

Methods applied in the present study allowed collection of a large amount of data on beetles-fungus associations. On the other hand, number of species and specimens of certain mycophagic species is low and some groups (Ciidae, Ptinidae, Tenebrionidae, Melandryidae) are underrepresented. This is because rearings were not performed during the present study.

Our study allowed to distinguish species specialised in a single genus or even species of host fungus, like *Derodontus macularis* and *Mycetoma suturale* which are associated with *Ischnoderma* P. KARST. The same results were obtained during trial at Babiogórski NP (CHACHUŁA & al 2018b). Our data confirm the plausible monophagy of *Octotemnus mandibularis* on *Trametes pubescens* (BOROWSKI & SZCZEPKOWSKI 2011, 2018).

Gyrophaena manca was the most ubiquitous beetle, collected on 16 species of fungi and present in 30 samples and *Atheta crassicornis* collected on 13 species of fungi and present in 30 samples.

Succession of beetles on basidiocarps was also observed. The genus *Gyrophaena* MANNERHEIM was dominant on fresh fruiting bodies, the genus *Oxypoda* MANNERHEIM was common on dead, dry sporocarps, and genera *Atheta* THOMSON, *Proteinus* LATREILLE, and *Nicrophorus* FABRICIUS were observed on rotting fungi. *Autalia longicornis* was present on mature or decaying fruiting bodies of *Meripilus giganteus* and was absent from fresh ones.

Sporocarps consistency classes

Sporocarps were grouped into consistency classes (Tab. 1) according to SCHIGEL & al. (2004) and our own data. The concept of consistency classes is based on the fact, that most of fungivore beetles are polyphagous and colonize polypores of certain consistency class rather than of certain genera. Due to our collecting methods (beetles were not reared in our study), results are not always comparable with data reported by SCHIGEL & al. (2004, 2006), but some similarities can be observed.

Several Ciidae (*Cis dentatus*, *C. glabratus*, *C. quadridens*, *C. castaneus*, *Ennearthron cornutum*), Dorcatoma punctulata, Bolitophagus reticulatus and *Peltis ferruginea* are associated with fomitoid basiciocarps.

Trametoid basidiocarps have their characteristic group of associated beetles, which include several species of Ciidae (*Cis boleti*, *C. fissicornis*, *C. micans*, *C. submicans*, *Octotemnus glabriculus*, *O. mandibularis*, *Sulcacis nitidus*) and Erotylidae.

Tyromycetoid basidiocarps, which are soft and watery, are in some cases (e.g. fruiting bodies of *Meripilus giganteus*) attractive for Staphylinidae and Tetratomidae.

Some Mycetophagidae (*Mycetophagus ater*, *M. multipunctatus*, *M. quadripustulatus*) and Tenebrionidae (*Eledona agricola*) are associated mainly with piptoporoid basidiocarps, consistent with SCHIGEL & al. (2004).

Differences in fauna of annual and perennial sporocarps

Fungi with annual (47 species) and with perennial (13 species) sporocarps share similar mean number of associated species of beetles per species of fungus (3.2 in the case of annual sporocarps and 3.3 in the case of perennial ones). In contrast, substantial differences between species' assemblages associated with both types of sporocarps can be noticed. Staphylinidae prefer annual fruiting bodies, where they constitute 65% of all associated species (51% in the case of perennial fruiting bodies).

Spatial distribution of rare and endangered species

Most localities of rare species of beetles were concentrated in the eastern part of the Pieniny NP, in the sampling areas of Wielka Dolina, Pajówka, Bajków Groń and Ociemny Potok (Central Pieniny). In contrast, only a few rare beetles were recorded in the western part of the studied area, mostly in the vicinity of Harczygrunt. Similar results were obtained during research on the flora in the Pieniny National Park (SZAFER, ZARZYCKI 1977) and fungi covered by species protection (CHACHUŁA 2012, 2016).

Valorization of forests of the Pieniny Mts. based on community of mycobiontic Coleoptera

BOROWSKI (2006) introduced a method of evaluation of forest complexes based on the occurrence of 259 species of beetles inhabiting polypores. The number of mycobiontic beetles in the Pieniny Mts. thanks to our research (sensu BOROWSKI 2006) increased from 41 to 60, and number of rare and relic species (sensu BOROWSKI 2006) increased from 1 to 4. Current values of three factors were calculated: actual valorization value of the community (WWZ_A) is 22.7% (15.6% in BOROWSKI 2006), qualitative index of species-level biodiversity of the community (dgj) is 20.7% (12.5% in BOROWSKI 2006), and valorization index of the object (WWO) is 21.7% (14% in BOROWSKI 2006). The values are to some extent influenced by the fact that most specimens of Cryptophagidae and Latridiidae remained unidentified in the present study. The value of WWO of the Pieniny Mts. is not only significantly lower that the same value of the most natural forest of Poland, the Białowieża Forest (WWO=74.4%, BOROWSKI 2006), but is also lower than WWO of forests in Rogów in central Poland (WWO=30.0%, BOROWSKI 2006). A list of the mycobiontic fungi of the Pieniny NP and Pieniny Mts. is still incomplete and more intense studies will influence the abovementioned values.

Acknowledgements

The research was financially supported by the Forest Fund of the State Forests National Forest Holding within the project “Beetles (Coleoptera) living in the fruiting bodies of Macromycetes in the Pieniny National Park”. Dr. Tomasz CISZEWSKI is thanked for his help with processing data. Dr. Marek L. BOROWIEC (University of Idaho, Moscow, USA) is thanked for linguistic assistance. We are indebted to Prof. Jerzy Borowski and Dr. Andrzej Mazur for their comments on the previous version of the manuscript.

STRESZCZENIE

Obserwacje prowadzone w PPN wykonano w ramach projektu badawczego „Chrząszcze (Coleoptera) zasiedlające owocniki grzybów (Macromycetes) na terenie Pienińskiego Parku Narodowego". Próby do badań zebrano z owocników 60 gatunków grzybów. Zasiedlone owocniki należały do grzybów podstawkowych (Basidiomycota) należących do rodzin: Bondarzewiaceae, Cystostereaceae, Fomitopsidaceae, Ganodermataceae, Gloeophyllaceae, Hapalopilaceae, Hymenochaetaceae, Meripilaceae, Meruliaceae, Polyporaceae i Steccherinaceae. Kilka gatunków grzybów należało do gatunków znajdujących się na Polskiej Czerwonej Liście a trzy gatunki mają status gatunków zagrożonych (*Dacryobolus karstenii, Fomitopsis rosea, Podofomes trogii*). Próby pobierano w latach 2016–2018 z 38 lokalizacji w zakresie wysokości od 421 do 949 m n.p.m. i zgromadzono 200 prób z których pozyskano chrząszcze do identyfikacji. Chrząszcze odławiane były za pomocą „U siatki", ekshaustora i aparatu Winklera. Stanowiska, na których pozyskiwano okazy zostały szczegółowo opisane (dane geograficzne, rodzaj siedliska, rodzaj substratu, gatunek grzyba, ilość owocników i ich stopień dojrzałości. Ogółem zebrano 6557 okazów, wśród których zidentyfikowano 194 gatunki chrząszczy należących do 29 rodzin, co stanowi ok. 13% wszystkich gatunków chrząszczy stwierdzanych w Pieninach. Dominującą gatunkowo rodziną były kusakowate – Staphylinidae (5565 okazów – 84,87% ogólnej liczy okazów z 114 gatunków – 58,76% łącznej liczby gatunków). Jako subdominującą wykazano rodzinę Ciidae (549 osobników z 16 gatunków), pozostałe 27 rodzin było reprezentowane przez 443 okazy należące do 64 gatunków. Stwierdzono gatunki chrząszczy wpisane na Polską Czerwoną Listę: *Bisnius puella*, *Derodontus macularis*, *Mycetoma suturale*, *Mycetophagus ater*, *Scaphisoma boreale*, *Octotemnus mandibularis.* Kilkanaście gatunków ma status rzadkich i reliktowych: *Agaricochara latissima*, *Atheta excelsa*, *Atheta liturata*, *Cis fissicornis*, *Colenis immunda*, *Gyrophaena minima*, *Hallomenus axilaris, Megarthrus hemipterus, Meotica filiformis*, *Orthoperus rogeri*, *Oxypoda formosa*, *Phloeonomus sjobergi*, *Proteinus crenulatus, Pteryngium crenatum*, *Scaphisoma subalpinum* i *Thymalus limbatus*. Stwierdzono również 148 gatunków nowych dla Pienin i 1 gatunek nowy dla Polski (*Gyrophaena rousi* DVOŘAK, 1966). Analiza danych zebranych podczas projektu pozwoliła na potwierdzenie wcześniej opublikowanych danych dotyczących przywiązania niektórych gatunków chrząszczy do jednej lub wąskiej gatunkowo grupy grzybów. Przykładem takiego przywiązania są *Derodontus maculatus* i *Mycetoma suturale* zasiedlające wyłącznie grzyby z rodziny *Ischnoderma*. Potwierdzono również monofagizm *Octotemnus mandibularis* w stosunku do owocników *Trametes pubescens*. Koleopterofauna zebrana podczas projektu należy do trzech grup ekologicznych (mycetokseny, mycetofile, mycetobionty). Ciidae okazały się najbogatszą gatunkowo rodziną obligatoryjnie związaną z grzybami (mycetobionty). W przypadku niektórych gatunków chrząszczy wykazano różnicę w preferencji do zasiedlania owocników o różnym stopniu ich dojrzałości. Wyraźną zależność pomiędzy jakością owocnika, a zasiedlającym go gatunkiem chrząszcza zaobserwowano w przypadku relacji pomiędzy *Autalia longicornis* SCHEERPELTZ, 1947 a gatunkiem grzyba *Meripilus giganteus*. Obecność *Autalia longicornis* została wykazana tylko na owocnikach dojrzałych i gnijących, a na świeżych nie stwierdzono jej obecności. Chrząszcze mycetobiontyczne pozwoliły również na określenie wartości przyrodniczej PPN. W wyniku przedstawionych badań i określeniu wskaźników waloryzacyjnych zmienił

się status wartości przyrodniczej BOROWSKIEGO z bardzo ubogiej przyrodniczo (wskaźnik waloryzacyjny obiektu WWO – 14%) na ubogą przyrodniczo (WWO – 20%), przy czym są to zaniżone wskaźniki ze względu na nieoznaczenie do gatunku części chrząszczy z rodzin Cryptophagidae i Latridiidae.

REFERENCES

ANONYMOUS. 1968: Compte-rendu du IV-éme Congrés des Mycologues Européens, Warszawa 1966. Acta Mycologica, **4** (2): 181-198.

ASSING V., SCHÜLKE M. 2012. Freude–Harde–Lohse–Klausnitzer – Die Käfer Mitteleuropas, Band 4. Staphylinidae I. Zweite neubearbeitete Auflage. Spektrum Akademischer Verlag, Heidelberg: I-XII + 1-560.

BENICK 1952: Pilzkäfer und Käferpilze. Ökologische und statistische Untersuchungen. Acta Zoologica Fennica, **70**: 1-309.

BOROWIEC L. 1991: New and rare Polish Coleoptera. Wiadomości Entomologiczne, **10** (4): 197-205. (in Polish)

BOROWSKI J. 2006: Beetles (Coleoptera) of the tree-fungi – a valorization study. SGGW Press, Warszawa. 92 pp. (in Polish)

BOROWSKI J. 2007: Valorization of stands in the Świętokrzyskie Mountains using mycetobiontic beetles of arboreal mushrooms. [In:] J. BOROWSKI, S. MAZUR (eds.) Valorization of the forest ecosystems of the Świętokrzyskie Mountains based on zooidication method. SGGW Press, Warszawa: 119-147. (in Polish)

BOROWSKI J., BYK A., MAZUR S., MOKRZYCKI T., RUTKIEWICZ A. 2013: Valorisation of the ecosystems of Forest Promotional Complex "Lasy Spalsko-Rogowskie" based on the structure of mycetobiontic tree – fungi beetles. Studia i Materiały CEPL w Rogowie, **2** (35): 175-196. (in Polish)

BOROWSKI J., SZCZEPKOWSKI A. 2011: New locality of *Octotemnus mandibularis* (GYLLENHAL, 1813) (Coleoptera: Ciidae) in Poland. Wiadomości Entomologiczne, **30** (2): 123-124. (in Polish)

BOROWSKI J., SZCZEPKOWSKI A. 2018: First locality of *Octotemnus mandibularis* (GYLLENHAL, 1813) (Coleoptera: Ciidae) in East Beskidy Mts. and remarks on the bionomy of the species. Wiadomości Entomologiczne, **37** (3): 190-191. (in Polish)

BUCHHOLZ L., MELKE A. 2018: Insects - beetles *Coleoptera*. [In]: M.D. BOĆKOWSKI (eds.): The projected Turnicki National Park. The state of natural values in 35 years from from the first design of the Park. Fundacja Dziedzictwo Przyrodnicze, Nowosiółki Dydyńskie: 314-377. (in Polish)

BURAKOWSKI B. 1995: Biology and life-history of *Mycetoma suturale* (PANZER) (Coleoptera: Melandryidae), with a redescription of the adult. [In:] J. PAKALUK, S.A. ŚLIPIŃSKI (eds.): Biology, Phylogeny and Classification of Coleoptera. Papers Celebrating the 80th Birthday of ROY A. CROWSON, 491-502.

CHACHUŁA P. 2012: New protected species of fungi in the Pieniny National Park. Pieniny – Przyroda i Człowiek, 12: 87-101. (in Polish).

CHACHUŁA P. 2016: The current state of knowledge about protected fungi after the changes in law and identification of new species and localities in the Pieniny National Park. Pieniny – Przyroda i Człowiek 14: 91-100 (in Polish).

CHACHUŁA P., BODZIARCZYK J., GACH M., SIEDLARCZYK E., BARCZYK M., ZIÓŁEK M. 2018a: Diversity of mycobiota found in the autumn-winter season in Pieniny National Park – preliminary results. Chrońmy Przyrodę Ojczystą, **74** (3): 181-193. (in Polish)

CHACHUŁA P., MELKE A., RUTA R. 2018b: Beetles (Coleoptera) living in the fruit bodies of Macromycetes in the Babia Góra National Park. Manuscript, Library of Babia Góra NP, 47 pp. (in Polish)

CHACHUŁA P., MELKE A., RUTA R., Szołtys H. 2018c: Appendices for article: Beetles (Coleoptera) collected on fruiting bodies of wood inhabiting polyporoid fungi in the Pieniny National Park (S Poland). ResearchGate: [December 2018] https://www.researchgate.net/publication/329571580_Appendices_for_article_Beetles_Coleoptera_collected_on_fruiting_bodies_of_wood_inhabiting_polyporoid_fungi_in_the_Pieniny_National_Park_S_Poland.

CLEMENÇON H. 2009: Methods for Working with Macrofungi. Laboratory Cultivation and Preparation of Larger Fungi for Light Microscopy. IHW-Verlag, Eching.

DOMAŃSKI S. 1991: Podstawczaki (Basidiomycetes). Bezblaszkowce (Aphyllophorales). Skórnikowate (Stereaceae). Purchawkowate (Podoscyphaceae). [In]. J. KOCHMAN, A. SKIRGIEŁŁO (eds.): Grzyby (Mycota). 21. Państwowe Wydawnictwo Naukowe, Warszawa-Kraków: 1-133.

GUMIŃSKA B. 1969: Mikoflora of the Pieniny National Park (part I). Acta Mycologica, **5**: 219-243.

GUMIŃSKA B. 1972: Mikoflora of the Pieniny National Park (part II). Acta Mycologica, **8** (2): 149-174.

GUMIŃSKA B. 1976: Mikoflora of the Pieniny National Park (part III). Zeszyty Naukowe UJ, 432, Prace Botaniczne, **4**: 127-141.

GUMIŃSKA B. 1990: Mikoflora of the Pieniny National Park (part V). Zeszyty Naukowe UJ, 968, Prace Botaniczne, **21**: 157-172.

GUMIŃSKA B. 1994: Mikoflora of the Pieniny National Park part VI. Fragmenta Floristica Geobotanica, Ser. Polonica, **1**: 33-39.

GUMIŃSKA B. 1999: Mikoflora of the Pieniny National Park part VII. Fragmenta Floristica Geobotanica, Ser. Polonica, **6**: 179-187.

GUMIŃSKA B. 2004: Mikoflora of the Pieniny National Park part VIII. Fragmenta Floristica Geobotanica, **11** (2): 371-382.

HANSEN L., KNUDSEN H. 2000: Nordic Macromycetes. 1. *Ascomycetes*. Nordsvamp, Copenhagen.

HORION A. 1951: Verzeichnis der Käfer Mitteleuropas (Deutschland, Österreich, Tschechoslovakei) mit kurzen faunistischen Angaben. 1-2. Stuttgart: X + 1-536. (in German)

INDEX FUNGORUM. 2017: Access 03.02.2017. [http://www.indexfungorum.org].

JAŁOSZYŃSKI P., WANAT M., RUTA R., KOMOSIŃSKI K. 2015: New records of Cryptophagidae (Coleoptera) in Poland: Cryptophaginae partim (excluding genera *Micrambe* and *Cryptophagus*). Wiadomości Entomologiczne, **34** (2): 39-52. (in Polish)

Karasiński D., Wołkowycki M. 2015. An Annotated And Illustrated Catalogue Of Polypores (Agaricomycetes) Of The Białowieża Forest (NE Poland). Polish Botanical Journal **60** (2): 217–292

KLEJDYSZ T., KUBISZ D. 2003: Fungicolous beetles (Coleoptera) inhabiting wood-destroying fungi in the Niepołomice Forest (Sandomierz Lowland, southern Poland). Roczniki naukowe Polskiego Towarzystwa Ochrony Przyrody "Salamandra", **7**: 145-166. (in Polish)

KLIMASZEWSKI J., PECK S.B. 1987: Succession and phenology of beetle faunas (Coleoptera) in the fungus *Polyporellus squamosus* (Huds.: Fr.) Karst. (Polyporaceae) in Silesia, Poland. Canadian Journal of Zoology, **65**: 542-550.

KNUDSEN H., VESTERHOLT J. (eds.) 2008: Funga Nordica. Agaricoid, boletoid and cyphelloid genera. Nordsvamp, Copenhagen.

KNUTELSKI S., KNUTELSKA E. 2014: Beetles of the Pieniny Mts. in the collection of the Pieniny National Park (Insecta: Coleoptera). Pieniny - Przyroda i Człowiek, **13**: 45-62. (in Polish)

KOMOSIŃSKI K. 2013: Methods for determining the natural value and naturalness of forest ecosystems based on saproxylic beetle assemblages [In:]: M. DYNOWSKA, H. Ciecierska (eds.): Biological methods for assessing the state of the environment. Volume 1. Terrestrial ecosystems. University of Warmia and Mazury in Olsztyn, Mantis press, 205-234. (in Polish)

KOMOSIŃSKI K., PALIŃSKA K. 2006: Saproxylic beetles (Coleoptera) of the Las Warmiński nature reserve in the Masurian Lakeland. [In:] Protection of insects in Poland. Entomological research, and the current legal and organizational situation of nature conservation. Wiadomości Entomologiczne, **25** (Suppl. **2**): 99-106. (in Polish)

KOTLABA F., LAZEBNIČEK J. 1967: IV sjezd evropskych mykologu, Polsko 1966. Česká Mycologia, **21** (1): 54-59. (in Czech)

KRASUTSKIY B.V. 1995: Fungicolous Coleoptera inhabitant of the wood-destroying fungi in the forests of West Siberia. Entomologiceskoe Obozrenie, **74** (3): 542-550. (in Russian)

KRASUTSKIY B.V. 1996: Fungicolous Coleoptera inhabiting the main wood-destroying fungi in the forest-steppe of the Transurals area. Entomologiceskoe Obozrenie, **75** (2): 244-247. (in Russian)

KRASUTSKIY B.V. 1997a: Beetles (Coleoptera) – mycetobionts of the main wood-destroying fungi of the Southern subzone of West Siberian taiga. Entomologiceskoe Obozrenie, **76** (2): 302-308. (in Russian)

KRASUTSKIY B.V. 1997b: Fungicolous Coleoptera inhabiting main wood-destroying fungi in the middle taiga subzone in West Siberia. Entomologiceskoe obozrenie, **76** (4): 770-776. (in Russian)

KRÓLIK R., RUTA R., MATUSIAK R. 2005: New positions of beetles from the genus Sulcacis (Coleoptera: Ciidae) w Polsce. Wiadomości Entomologiczne, **24** (4): 227-233. (in Polish)

KRÓLIK R., RUTA R. 2016: *Ropalodontus novorossicus* REITTER, 1901 – a species of beetle new to the Polish fauna and new data on the occurrence of *Ropalodontus* MELLIÉ, 1847 (Coleoptera: Ciidae). Acta Entomologica Silesiana, **24**: 1-8. (in Polish)

KUBISZ D., IWAN D., TYKARSKI P. 2015: Tenebrionoidea: Mycetophagidae, Ciidae, Mordellidae, Zopheridae, Meloidae, Pyrochroidae, Salpingidae, Anthicidae. Critical checklist, distribution in Poland and meta-analysis. Coleoptera Poloniae, Vol. 3: 1-744.

KUBISZ D., RUTA R., JAŁOSZYŃSKI P., KONWERSKI SZ., KRÓLIK R. 2010: A faunistic review of beetle families Tetratomidae and Melandryidae (Coleoptera: Tenebrionoidea) of Poland. Polish Journal of Entomology, **79**: 107-138.

KUBISZ D., SZAFRANIEC S. 2001: Interesting species of beetles found in the Babia Góra massif, West Beskid (Coleoptera). Acta entomologica silesiana, **7–8**: 43-48. (in Polish)

KUJAWA A. 2016: Macroscopic fungi of Poland in mycological literature (version: June 2016). [in:] SNOWARSKI M. Atlas of fungi of Poland. Access: 03.02.2017. [http://www.grzyby.pl/grzyby-makroskopijne-Polski-w-literaturze-mikologicznej.htm]. (in Polish)

LIK M. 2005: Population dynamics of the black tinder fungus beetles *Bolitophagus reticulatus*. Folia Biologica (Kraków), **53**: 171-177.

LIK M., BARCZAK T. 2005: Seasonal dynamics of Ciidae (Coleoptera) in different kinds of forest habitats. Sylwan, **10**: 54-60.

LÖBL I., SMETANA A. 2004: Catalogue of Palaearctic Coleoptera. Vol. 2. Hydrophiloidea, Histeroidea, Staphylinoidea. Apollo Books: 1-942.

LÖBL I., SMETANA A. 2006: Catalogue of Palaearctic Coleoptera. Vol. 3. Scarabaeoidea, Scirtoidea, Dascilloidea, Buprestoidea, Byrrhoidea. Apollo Books: 1-690.

LÖBL I., SMETANA A. 2007: Catalogue of Palaearctic Coleoptera. Vol. 4. Elateroidea, Derodontoidea, Bostrichoidea, Lymexyloidea, Cleroidea, Cucujoidea. Apollo Books: 1-935.

LÖBL I., SMETANA A. 2008: Catalogue of Palaearctic Coleoptera. Vol. 5. Tenebrionoidea. Apollo Books: 1-670.

LÖBL I., SMETANA A. 2010: Catalogue of Palaearctic Coleoptera. Vol. 6. Chrysomeloidea. Apollo Books, 1-924.

LONSDALE D., PAUTASSO M., HOLDENREIDER O. 2008: Wood-decaying fungi in the forest: conservation needs and management options. European Journal of Forest Research, **127**: 1-22.

MARCZAK D., DANYŁOW A., PEPŁOWSKA-MARCZAK D., MELKE A., PACUK B., MASIARZ J. 2012: New positions of rare, interesting and protected beetle species (Coleoptera) in the fauna of the Kampinos National Park. Parki Narodowe i Rezerwaty Przyrody, **31** (1): 109-119. (in Polish)

MELKE A., SZAFRANIEC S. 2003: Materials to get to know Aleocharinae (Coleoptera: Staphylinidae) of the Western Beskids. Wiadomości Entomologiczne, **21** (4): 197-203. (in Polish)

MELKE A., SZAFRANIEC S., SZOŁTYS H., 1998: Saproxylic rove-beetles (Coleoptera, Staphylinidae) of the nature reserves of the Katowice voivodship. Natura Silesiae Superioris, **2**: 73-79. (in Polish)

NIKITSKY N.B., OSIPOV I.N., CHEMERIS M.V., SEMENOV V.B., GUSAKOV A.A. 1996: The beetles of the Prioksko-Terrasny Biosphere Reserve – Xylobiontes, Mycetobiontes and Scarabaeidae (With the review of the Moscow region fauna of the groups). Archives Zoological Museum Moscow State University, **36**: 1-197. (in Russian)

NIKITSKY N.B., SEMENOV V.B., DOLGIN M.M. 1998: Beetles xylobionts, mycetobionts and scarabaeids of Prioksko-Terrasny Biosphere Reserve. Supplementum 1. Archives Zoological Museum Moscow State University, **36**: 1-55. (in Russian)

PAWŁOWSKI J. 2008: Relict beetles Coleoptera "Carpathian Forest". Roczniki Bieszczadzkie, **16**: 317-324. (in Polish)

PAWŁOWSKI J., KUBISZ D., MAZUR M. 2002: Coleoptera-beetles. [In:] Z. GŁOWACIŃSKI (eds.): A red list of endangered and threatened animals in Poland. PAN, IOP, Kraków: 88-110. (in Polish)

REIBNITZ J. 1999: Verbreitung und Lebensräume der Maumschwammfresser Südwestdeutschlands (Coleoptera: Cisidae). Mitteilungen Entomologischen Verein Stuttgart, **34**: 1-76.

RENNER K., MESSUTAT J. 2007: Untersuchungen zur Käferfauna der Umgebung von Skwierzyna im westlichen Polen (Wielkopolska). Coleo, **8**:16-20.

Rosa-Gruszecka A., Gange A.C., Harvey D.J., Jaworski T., Hilszczański J., Plewa R., Konwerski S., Hilszczańska D. 2016: Insect-truffle interactions e potential threats to emerging industries? Fungal Ecology, **25**: 59-63.

ROSSA R., WOJAS T., MICHALCEWICZ J., PRZEWOŹNY M., BARANIAK E., BRZESKI M., GRZEGORCZYK T. 2018: New data on the occurrrence of rare and endangered species of beetles (Coleoptera) in the Niepołomice Forest near Kraków. Wiadomości Entomologiczne, **37** (4): 210-229. (in Polish)

ROZPORZĄDZENIE MINISTRA ŚRODOWISKA z dnia 9 października 2014 r. w sprawie ochrony gatunkowej grzybów. Dziennik Ustaw, poz. 1408.

RUTA R., GAWROŃSKI R., JAŁOSZYŃSKI P., MIŁKOWSKI M. 2010: Contribution to the knowledge of Corylophidae (Coleoptera: Cucujoidea) of Poland. Polish Journal of Entomology, **79**: 223-234.

RUTA R., JAŁOSZYŃSKI P., SIENKIEWICZ P., KONWERSKI Sz. 2011: Erotylidae (Insecta: Coleoptera) of Poland – problematic taxa, updated keys and new records. ZooKeys, **134**: 1-13.

RUTA R., KONWERSKI SZ., MIŁKOWSKI M., GAWROŃSKI R., KOMOSIŃSKI K., MELKE A., MARCZAK D. 2012: New records of Mycetophagidae (Coleoptera: Tenebrionoidea) in Poland. Wiadomości Entomologiczne, **31** (4): 274-287. (in Polish)

SCHIGEL D.S. 2002: Beetle complexes in polypore fungi in East European Plain and Crimea. Bull Moscow Soc Nat, **107**: 8-21. (in Russian)

SCHIGEL D.S. 2011: Polypore-beetle associations in Finland. Annales Zoologici Fennici, **48**: 319-348.

SCHIGEL D.S. 2012: Fungivory and host associations of Coleoptera: a bibliography and review of research approaches. Mycology, **3** (4): 258-272.

SCHIGEL D.S., NIEMELÄ T., KINNUNEN J. 2006: Polypores of western Finnish Lapland and seasonal dynamics of polypore beetles. Karstenia, **46**: 37-64.

SCHIGEL D.S., NIEMELÄ T., SIMILÄ M., KINNUNEN J., MANNINEN O. 2004: Polypores and associated beetles od the North Karelian Biosphere Reserve, eastern Finland. Karstenia, **44**: 35-56.

SMOLEŃSKI M. 2000: Staphylinid (Coleoptera: Staphylinidae) associations of the coastal variety of coniferous forest type (*Empetro-nigri Pinetum*) case study of the Łebsko sand bar, Słowiński National Park. Wiadomości Entomologiczne, **18** (4): 207-222. (in Polish)

SOKÓŁ S. 2000: Ganodermataceae of Poland. Taxonomy, ecology and distribution. Prace Naukowe Uniwersytetu Śląskiego **1867**: 1-134.

STANIEC B., PIETRYKOWSKA-TUDRUJ E., CZEPIEL-MIL K. 2016: Larva of *Gyrophaena boleti* (LINNAEUS, 1758) (Coleoptera: Staphylinidae) – an obligatory saproxylic and mycophagous species associated with *Fomitopsis pinicola:* notes on tergal gland system and behavior. Annales Zoologici, **66** (1): 83-100.

SZAFER W., ZARZYCKI K. (red.) 1977: Szata roślinna Polski, Tom 2 (wyd. III). Państwowe Wydawnictwo Naukowe, Warszawa. (in Polish).

SZAWARYN K., ŻÓRALSKI R. 2018: New record of *Phloiophilus edwardsi* STEPHENS, 1830 (Coleoptera: Phloiophilidae) on the Baltic Coast and notes on its biology. Acta entomologica silesiana, **26**: 1-5.

SZCZEPKOWSKI A., GIERCZYK B., BOROWSKI J., NEUBAUER G. 2017: New localities of *Sarcodontia crocea* (Polyporales, Basidiomycota) in Poland. Acta Mycologica, **52** (1): 1090. https://doi. org/10.5586/am.1090.

SZUJECKI A. 1987: Tree-dwelling Staphylinidae (Col.) of the Western Bieszczady Mts. with particular reference to the species occurring in the galleries of cambio- and xylophages. [In:] IVth Symposium on the Protection of Forest Ecosystems, Rogów 25-26 November 1986. Warszawa: 111-131.

SZUJECKI A. 1996: Rove-beetles (Coleoptera: Staphylinidae) of the Western Bieszczady.Warszawa. 224 pp. (in Polish)

SZUJECKI A. J. 2017: Rove-beetles (Staphylinidae) of Polish forests, aspect of diversity and zooindication monitoring. CILP, Warszawa: 1-255. (in Polish)

TENENBAUM SZ. 1929: New species and varieties of beetles for Poland IV. Polskie Pismo Entomologiczne, **7** (1-4): 188-192. (in Polish)

WAGNER G.K., GOSIK R. 2016: Comparative morphology of immature stages of two sympatric Tenebrionidae species, with comments on their biology. Zootaxa, **4111** (3): 201-222.

WHEELER Q., BLACKWELL M. (eds.) 1984: Fungus–insect relationships: perspective in ecology and evolution. New York (NY) Columbia University Press. 514 pp.

WILDING H.N., COLLINS N.M., HAMMOND P.M. (eds.) 1989: Insect–fungus interactions. London: Academic Press. 344 pp.

WOJEWODA W. 1991: The first red list of macromycetes threatened in the Polish Carpathians. Studia Ośrodka Dokumentacji Fizograficznej, **18**: 239-261. (in Polish)

WOJEWODA W. 2003: Checklist of Polish larger Basidiomycetes. [In:] Z. MIREK (eds.): Biodiversity of Poland. Vol. 7. W. Szafer Institute of Botany, Polish Academy of Sciences. Kraków.

WOJEWODA W., ŁAWRYNOWICZ M. 2006: Red list of Macromycetes in Poland. [In:] Z. MIREK, K. ZARZYCKI, W. WOJEWODA, Z. SZELĄG (eds.): Red list of plants and fungi in Poland. W. Szafer Institute of Botany, Polish Academy of Sciences. Kraków: 53-70. (in Polish)

WRÓBLEWSKI A. 1922: List of mushrooms collected in the years 1913-1918 from the Tatra Mountains, Pieniny, Eastern Beskids, Podkarpacie, Podole, Roztocze and other places. Sprawozdanie Komisji Fizjograficznej, **55/56**: 1-50. (in Polish)

Wpłynęło/Received: 12-12-2018

Przyjęto/Accepted: 28-01-2019