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## Springtails (*Collembola*) of the Karkonosze Mountains (Poland)

**Abstract:** Faunistic studies in the Polish part of the Karkonosze Mts (W Sudetes) have revealed 128 species, including 5 species new to the fauna of the Sudetes and 41 species new to the fauna of the Karkonosze Mts. The total number of *Collembola* species of the Karkonosze Mts is 145, including species recorded in earlier studies. The author distinguished six zoogeographical elements in the *Collembola* fauna of the Karkonosze Mts: widely distributed, montane, Boreal-montane, Arctic-montane, Circumpolar and endemic. The fauna of springtails of the Karkonosze Mts is roughly comparable to the fauna of East Sudetes with a relatively high proportion of cavicolous and ripicolous species.

**Key words:** *Collembola*, fauna of the Karkonosze Mountains, Sudetes, Poland

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### INTRODUCTION

In spite of many years of study, our knowledge of springtails fauna of the Karkonosze Mountains (Sudetes, SW Poland) is still not sufficient and is far from the expected state. Up to now 110 *Collembola* species have been recorded from the Karkonosze Mts (UZEL 1891, SCHÄFFER 1896, BÖRNER 1903, DENIS 1931, SCHUBERT 1933, 1935; STACH 1964; DUNGER 1970a, b, c; POMORSKI 1992b; SKARŻYŃSKI 1994, 1999, 2000; SKARŻYŃSKI & POMORSKI 1996b; POMORSKI & Skarżyński 2000).

The aim of this study was to complement the faunistic inventory of *Collembola* of the Karkonosze Mts and to appreciate the ecological and zoogeographical uniqueness of the fauna.

## MATERIAL AND METHODS

The material was collected in 1990, 1994, 1999 and 2000 in the Polish part of the Karkonosze Mts. Springtails were collected from March to December in various habitats (excluding synanthropic ones) using commonly accepted methods, i.e. sampling of soil and litter, moss tufts, lichens and flood debris, followed by extraction of the animals with a Tullgren apparatus; also catches with an exhaustor, flotation of sand, pieces of bark and fragments of rotting wood. A total of c. 200 samples were collected in the following habitats and localities (plant associations after FABISZEWSKI 1985):

- I. Highlands zone (400–500 m above sea level).
  1. *Galio-Carpinetum* and *Luzulo-Quercetum*: “Chojnik” and “Szkłarka” reserves.
  2. *Leucobryo-Pinetum*: “Chojnik” and “Szkłarka” reserves.
- II. Lower subalpine zone (500–1000 m above sea level).
  3. *Luzulo-Fagetum*, *Dentario enneaphyllidis-Fagetum* and *Abieti-Piceetum montanum*: Szkłarka reserve, Wrzosówka stream valley, environs of Michałowice, Kowary, Karpacz, Borowice, Przesieka, Jagniątków, Szklarska Poręba.
  4. Meadows (not cultivated): environs of Kowary, Karpacz, Borowice, Przesieka, Szklarska Poręba.
  5. Wet habitat of springs and streams, small water reservoirs: valleys of streams: Szkłarka, Wrzosówka, Czarna Płóczka, Łomniczka, Polski Potok.
- III. Upper subalpine zone (1000–1250 m above sea level).
  6. *Plagiothecio-Piceetum hercynicum*, *Plagiothecio-Piceetum hercynicum sphagnetosum*: neighbourhood of Hala Szrenicka, Mumławski Wierch, Czarny Kocioł, Kocioł Łomniczki, Skalny Stół.
- IV. Dwarf mountain pine zone (1250–1450 m above sea level).
  7. *Pinetum mughi sudeticum* with patches of *Empetro-Vaccinietum*, *Pado-Sorbetum*, *Salicetum lapponum*: Szrenica, Śnieżne Kotły, Kocioł Małego Stawu, Kocioł Łomniczki, Czarny Grzbiet.
  8. Peat bogs: Szrenickie Mokradła, Równia pod Śnieżką.
- V. Alpine zone (1450–1603 m above sea level)
  9. Saxicolous grasslands (*Carici rigididae-Festucetum supinae*): Śnieżka.
- VI. Azonal habitats.
  10. Epilittoral of rivers: Kamienna, Łomnica.
  11. Cavicolous habitats (adits, deep crevices and caverns in granitic rocks): environs of Kowary, Karpacz (Krucze Skały), Podgórzyn and Szklarska Poręba (Krzywa Baszta, Czerwona Jama).

## RESULTS

The material collected in the region studied comprised 128 *Collembola* species, including 5 species new to the fauna of the Sudetes and 41 species new to the fauna of the Karkonosze Mts (Table I). Of the 110 species previously mentioned in the literature, 6 should be deleted from the inventory on account of changed taxonomic status [*Hypogastrura armata* (NICOLET), *Onychiurus fimetarius* (auct.), *Onychiurus sibiricus*



(TULLBERG), *Tullbergia krausbaueri* (BÖRNER) (DUNGER 1970a)] or wrong identification [*Isotoma fennica* (REUTER), *I. propinqua* (AXELSON) (SKARŻYŃSKI 1999)] and for 17 species (*Podura aquatica*, *Ceratophysella bengtssoni*, *Pseudachorutes subcrassus*, *Neanura parva*, *Uzelia dahli*, *Proisotoma minima*, *Vertagopus cinerea*, *Isotoma anglicana*, *Isotoma pseudomaritima*, *Isotomurus palliceps*, *Orchesella villosa*, *Willowsia buski*, *Pseudosinella alba*, *Arrhopalites terricola*, *Deuterosminthurus pallipes*, *Heterosminthurus linnaniemi*, *Bourletiella hortensis*) their occurrence should be confirmed. Considering all the circumstances, the approximate number of the *Collembola* species of the Polish part of the Karkonosze Mts can be estimated at 145.

Table I. List of springtails (*Collembola*) of the Karkonosze Mts. The sequence of genera is given after SZEPTYCKI & WEINER (1990). The habitat numbers correspond to the numbers in the text (see Material and methods). Abbreviations: \* – species new to the Karkonosze Mts, \*\* – species new to the Sudetes, Lit. – literature data (see Introduction).

Species	Habitats under study											Lit.	
	1	2	3	4	5	6	7	8	9	10	11		
<i>Poduridae</i>													
<i>Podura aquatica</i> LINNAEUS, 1758													+
<i>Hypogastruridae</i>													
<i>Hypogastrura assimilis</i> (KRAUSBAUER, 1898)*										+			
<i>H. brevifurca</i> SKARŻYŃSKI, 2000			+										+
<i>H. purpurescens</i> (LUBBOCK, 1869)										+	+		+
<i>H. viatica</i> (TULLBERG, 1872)										+			+
<i>Ceratophysella bengtssoni</i> (AGREN, 1904)													+
<i>C. cavicola</i> (BÖRNER, 1901)												+	+
<i>C. denticulata</i> (BAGNALL, 1941)	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>C. engadinensis</i> (GISIN, 1949)							+				+		+
<i>C. cf. armata</i> (NICOLET, 1841)** <sup>1)</sup>											+		
<i>C. succinea</i> (GISIN, 1949)*				+									
<i>Orogastrura parva</i> (GISIN, 1949)							+		+				+
<i>Schaefferia emucronata</i> ABSOLON, 1900*												+	
<i>S. willemi</i> (BONET, 1930)										+	+		+
<i>Mesogastrura ojcoviensis</i> (STACH, 1919)**												+	
<i>Xenylla boernerii</i> AXELSON, 1905 *	+		+				+	+					
<i>X. maritima</i> TULLBERG, 1869*								+					
<i>W. anophthalma</i> BÖRNER, 1901	+		+		+	+	+	+	+	+	+	+	+
<i>Willemia denisi</i> MILLS, 1932	+		+								+		+
<i>Odontellidae</i>													
<i>Xenyllodes armatus</i> AXELSON, 1903					+						+		+
<i>Neanuridae</i>													
<i>Brachystomella parvula</i> (SCHÄFFER, 1896)*	+			+	+						+		
<i>Friesea claviseta</i> AXELSON, 1900*	+							+			+		
<i>F. mirabilis</i> (TULLBERG, 1871)									+		+		+
<i>F. truncata</i> CASSAGNAU, 1958*	+	+	+	+		+	+			+	+		
<i>Pseudachorutes corticolus</i> (SCHÄFFER, 1896)*	+		+								+		
<i>P. dubius</i> KRAUSBAUER, 1898*	+		+					+					
<i>P. parvulus</i> BÖRNER, 1901			+								+		+

Species	1	2	3	4	5	6	7	8	9	10	11	Lit.
<i>P. subcrassus</i> TULLBERG, 1871												+
<i>Pseudachorutella asigillata</i> (BÖRNER, 1901)*			+			+						
<i>Micranurida forsslundi</i> GISIN, 1949			+									+
<i>M. granulata</i> (AGRELL, 1943)	+		+			+	+				+	+
<i>M. pygmaea</i> BÖRNER, 1901	+	+	+	+		+	+	+	+	+		+
<i>M. sensillata</i> GISIN, 1953*										+		
<i>Anurida granaria</i> (NICOLET, 1847)					+					+	+	+
<i>Neanura muscorum</i> (TEMPLETON, 1835)	+		+	+		+				+	+	+
<i>N. parva</i> (STACH, 1951)												+
<i>Deutonura albella</i> (STACH, 1920)*	+									+		
<i>D. conjuncta</i> (STACH, 1926)	+		+		+	+	+	+		+	+	+
<i>Thaumanura carolii</i> (STACH, 1920)	+		+			+						+
<i>Onychiuridae</i>												
<i>Tetradontophora bielaniensis</i> (WAGA, 1842)	+	+	+	+	+	+	+	+	+	+	+	+
<i>Hymenaphorura dentifera</i> (STACH, 1934) sensu POMORSKI 2000	+		+			+	+		+	+	+	+
<i>H. improvisa</i> POMORSKI & SKARŻYŃSKI, 2000										+		+
<i>H. nova</i> POMORSKI, 1990										+		+
<i>H. parva</i> SKARŻYŃSKI & POMORSKI, 1996	+		+			+	+			+		+
<i>H. polonica</i> POMORSKI, 1990*	+		+							+	+	
<i>Micraphorura absoloni</i> (BÖRNER, 1901)	+	+	+			+	+	+		+	+	+
<i>Oligaphorura groenlandica</i> (TULLBERG, 1876)										+		+
<i>Protaphorura armata</i> (TULLBERG, 1869)	+	+	+	+	+	+	+	+	+	+	+	+
<i>P. campata</i> (GISIN, 1952)							+					+
<i>P. cancellata</i> (GISIN, 1956)	+		+		+							+
<i>P. fimata</i> (GISIN, 1952)*										+		
<i>P. pseudovanderdrifti</i> (GISIN, 1957)**					+					+		
<i>P. subarmata</i> (GISIN, 1957)										+		+
<i>P. subuliginata</i> (GISIN, 1956)										+		+
<i>P. tricampata</i> (GISIN, 1956)				+								+
<i>Supraphorura furcifera</i> (BÖRNER, 1901)										+		+
<i>Deharvengiurus denisi</i> (STACH, 1934)*	+		+								+	
<i>Deuteraphorura cebennaria</i> (GISIN, 1956)*										+	+	
<i>D. silesiaca</i> (DUNGER, 1977)*										+		
<i>Orthonychiurus stachianus</i> (BAGNALL, 1939)										+		+
<i>Onychiuroides granulatus</i> (STACH, 1930)	+		+	+	+	+	+	+	+	+		+
<i>Paratullbergia callipygos</i> (BÖRNER, 1903)*	+		+								+	
<i>Mesaphorura delamarei</i> WEINER, 1991										+		+
<i>M. italica</i> (RUSEK, 1971)*			+									
<i>M. macrochaeta</i> RUSEK, 1976	+		+	+	+	+	+	+	+	+	+	+
<i>M. tenuisensillata</i> RUSEK, 1974	+		+	+		+	+		+	+		+
<i>Stenaphorurella quadrispina</i> (BÖRNER, 1901)	+									+		+
<i>Isotomidae</i>												
<i>Uzelia dahli</i> (BÖRNER, 1903)												+
<i>Tetracanthella brachyura</i> (BAGNALL, 1949)					+							+
<i>T. fjellbergi</i> DEHARVENG, 1987	+	+	+		+	+	+	+	+	+		+
<i>Anurophorus laricis</i> STACH, 1842*		+										



Species	1	2	3	4	5	6	7	8	9	10	11	Lit.
<i>Pseudanurophorus binoculatus</i> KSENEMAN, 1934						+	+	+	+			+
<i>Folsomia candida</i> (WILLEM, 1902)*										+		
<i>F. fimetaria</i> (LINNAEUS, 1758)	+									+		+
<i>F. inoculata</i> STACH, 1947	+		+		+	+						+
<i>F. lawrencei</i> RUSEK, 1984*										+	+	
<i>F. penicula</i> BAGNALL, 1939	+	+	+		+	+				+		+
<i>F. quadrioculata</i> (TULLBERG, 1871)	+	+	+	+	+	+	+	+	+	+	+	+
<i>F. sensibilis</i> KSENEMAN, 1936						+	+	+	+			+
<i>F. tesarı</i> DUNGER, 1970						+	+	+				+
<i>Proisotoma minuta</i> (TULLBERG, 1871)*										+		
<i>P. cf. minima</i> (ABSOLON, 1901)												+
<i>Hydroisotoma schaefferi</i> (KRAUSBAUER, 1898)*					+							
<i>Cryptopygus bipunctatus</i> (AXELSON, 1903)	+									+		+
<i>Agrenia bidenticulata</i> (TULLBERG, 1876)					+	+	+	+				+
<i>Isotomiella minor</i> (SCHÄFFER, 1896)	+	+	+	+	+	+	+	+	+	+	+	+
<i>Pseudisotoma sensibilis</i> (TULLBERG, 1876)	+	+	+		+	+	+	+	+	+		+
<i>Vertagopus cinerea</i> (NICOLET, 1841)												+
<i>V. westerlundi</i> (REUTER, 1897)						+	+					+
<i>Parisotoma notabilis</i> SCHÄFFER, 1896	+	+	+	+	+	+	+	+	+	+	+	+
<i>Isotoma anglicana</i> LUBBOCK, 1862												+
<i>I. hiemalis</i> SCHÖTT, 1893			+									+
<i>I. olivacea</i> TULLBERG, 1871	+		+			+	+			+		+
<i>I. pseudomaritima</i> STACH, 1947												+
<i>I. tigrina</i> TULLBERG, 1871*	+		+	+	+	+	+	+	+	+		
<i>I. violacea</i> TULLBERG, 1876	+		+		+	+		+	+	+		+
<i>I. viridis</i> BOURLET, 1839				+	+	+	+	+	+			+
<i>Isotomurus palliceps</i> (UZEL, 1891)												+
<i>I. palustris</i> (MÜLLER, 1776)					+	+	+	+		+		+
<i>Tomoceridae</i>												
<i>Tomocerus minor</i> (LUBBOCK, 1862)	+		+	+	+	+				+	+	+
<i>T. minutus</i> (TULLBERG, 1876)			+			+				+	+	+
<i>Pogonognathellus flavescens</i> (TULLBERG, 1871)	+		+	+	+	+		+	+	+	+	+
<i>P. longicornis</i> (MÜLLER, 1776)	+		+							+		+
<i>Entomobryidae</i>												
<i>Orchesella alticola</i> UZEL, 1890	+	+	+									+
<i>O. bifasciata</i> NICOLET, 1841	+		+		+							+
<i>O. flavescens</i> (BOURLET, 1839)	+	+	+	+	+	+	+	+				+
<i>O. villosa</i> (GEOFFROY, 1764)												+
<i>Heteromurus nitidus</i> (TEMPLETON, 1835)										+	+	+
<i>Entomobrya corticalis</i> (NICOLET, 1841)*	+	+	+			+	+					
<i>E. multifasciata</i> (TULLBERG, 1871)*	+	+	+									
<i>E. muscorum</i> (NICOLET, 1841)*	+			+								
<i>E. nivalis</i> (LINNAEUS, 1758)	+	+	+	+		+	+	+				+
<i>Willowsia buski</i> (LUBBOCK, 1869)												+
<i>Lepidocyrtus cyaneus</i> TULLBERG, 1871			+								+	+
<i>L. lanuginosus</i> (GMELIN, 1788)	+		+									+
<i>L. lignorum</i> (FABRICIUS, 1793)	+	+	+	+		+	+	+	+	+		+

Species	1	2	3	4	5	6	7	8	9	10	11	Lit.
<i>L. violaceus</i> LUBBOCK, 1873	+		+			+						+
<i>Pseudosinella alba</i> (PACKARD, 1873)												+
<i>P. immaculata</i> (LIE-PETTERSEN, 1896)**				+						+		
<i>P. zygophora</i> (SCHILLE, 1908)*	+											
<i>Neelidae</i>												
<i>Megalothorax minimus</i> WILLEM, 1900	+		+	+	+	+	+	+	+		+	+
<i>Neelides minutus</i> (FOLSOM, 1901)*			+		+							
<i>Sminthuridae</i>												
<i>Sphaeridia pumilis</i> (KRAUSBAUER, 1898)	+		+	+	+	+	+			+		+
<i>Sminthurides malmgreni</i> (TULLBERG, 1876)					+	+	+	+				+
<i>S. parvulus</i> (KRAUSBAUER, 1898)					+	+						+
<i>S. schoetti</i> (AXELSON, 1903)					+	+		+				+
<i>Arrhopalites caecus</i> (TULLBERG, 1871)										+		+
<i>Arrhopalites principalis</i> STACH, 1945	+		+			+	+			+		+
<i>A. pygmeus</i> (WANKEL, 1860)*	+		+			+	+				+	
<i>A. terricola</i> GISIN, 1958												+
<i>Gisinianus flammeolus</i> (GISIN, 1957)**	+		+									
<i>Sminthurinus alpinus</i> GISIN, 1953*	+	+										
<i>S. aureus</i> (LUBBOCK, 1867)	+		+			+	+	+	+			+
<i>S. gisini</i> GAMA, 1965	+		+									+
<i>Dicyrtoma fusca</i> (LUCAS, 1842)	+		+			+						+
<i>Dicyrtomina minuta</i> (FABRICIUS, 1783)	+		+	+			+					+
<i>Deuterostminthurus pallipes</i> (BOURLET, 1842)												+
<i>Heterostminthurus bilineatus</i> (BOURLET, 1842)*				+								
<i>H. linnaniemii</i> (STACH, 1920)												+
<i>Bourletiella hortensis</i> (FITCH, 1863)												+
<i>Lipothrix lubbocki</i> (TULLBERG, 1872)	+		+									+
<i>Allacma fusca</i> (LINNAEUS, 1758)	+		+									+
<i>Caprainea marginata</i> (SCHÖTT, 1893)*				+								
<i>Sminthurus nigromaculatus</i> TULLBERG, 1872*				+								
<i>S. viridis</i> (LINNAEUS, 1758)	+		+	+								+
Total species: 145	67	20	66	31	36	53	45	31	25	69	31	104

<sup>1)</sup> Species new to science. Its description will be published in a separate paper (SKARŻYŃSKI in press).

#### Ecological remarks

The majority of species identified are representatives of Central-European forest fauna. The species composition of the main ecological groups of springtails fauna is typical of the Sudetes (DUNGER 1977a, POMORSKI 1992a, SKARŻYŃSKI 1992). Special attention must be paid to two habitats with a rich and unique fauna: cavicolous habitats and epilittoral of rivers.

As regards "cave" fauna, *Schaefferia emucronata*, *Ceratophysella cavicola* and *Mesogastrura ojcoviensis* were not recorded outside "caves". These species should be regarded as regional troglobionts (POMORSKI 1992b). *Hypogastrura purpurescens*, *Schaefferia willemi*, *Anurida granaria*, *Deuteraphorura cebennaria*, *Folsomia lawrencei* and *Heteromurus nitidus*, which were collected in "caves" and in gravel beds of rivers, and *Deharvengiu-*



*rus denisi* and *Arrhopalites pygmeus*, which were collected in "caves" and in deep litter, should be regarded as troglolithes. The remaining species are troglolithes.

The ripicolous fauna is represented here by two groups of species. The first one consists of species which inhabit flood debris: *Hypogastrura assimilis*, *H. purpurescens*, *H. viatica*, *Micranurida sensillata*, *Protaphorura fimata*, *Supraphorura furcifera*, *Deuteraphorura silesiaca*, *Orthonychiurus stachianus*, *Folsomia candida*, *Proisotoma minuta*, *Cryptopygus bipunctatus*, *Arrhopalites caecus*, and the second one consists of species which live in interstitial habitats: *Schaefferia willemi*, *Xenyllodes armatus*, *Anurida granaria*, *Hymenaphorura nova*, *H. improvisa*, *Oligaphorura groenlandica*, *Protaphorura subarmata*, *Deuteraphorura cebennaria*, *Folsomia lawrencei*, *Heteromurus nitidus*. The rest of the epilittoral fauna is accidental and is originated from adjacent habitats.

Special attention must be also paid to a small group of species usually collected above 1000 m above sea level consisting of *Orogastrura parva*, *Pseudanurophorus binoculatus*, *Folsomia sensibilis*, *F. tesaří*, *Agrenia bidenticulata* and *Vertagopus westerlundii* as the species composition is typical of the highest mountain ranges of the Sudetes (DUNGER 1970d, 1977a, b; SKARŻYŃSKI & POMORSKI 1996a).

#### ZOOGEOGRAPHICAL REMARKS

The springtails fauna of the Karkonosze Mts constitutes c. 60 % of the Sudetic fauna (c. 235 species) (STACH 1964, DUNGER 1970a, b, d, 1977b; POMORSKI 1992a, b; POMORSKI & SKARŻYŃSKI 2000; SKARŻYŃSKI 1992, 1999, 2000; SKARŻYŃSKI & POMORSKI 1996a, b; SMOLIS & POMORSKI 1998) and roughly resembles that of the East Sudetes in species number and composition (DUNGER 1970b, d, 1977b, SKARŻYŃSKI & POMORSKI 1996a). The fauna under study appears impoverished in comparison with the springtails fauna of other Central-European mountain ranges, such as Pieniny Mts (191 species) (WEINER 1981) or the Low Tatras (202 species) (NOSEK 1969). The faunistic differences between the ranges are due to physiographical conditions (for example lack of "warm", calcareous rocks in the Karkonosze Mts) and events in the Tertiary and Quaternary periods. During Pleistocene the Karkonosze Mts were close to the head of the continental glacier and were covered with local glaciations.

The majority of recorded species have wide geographical ranges of distribution: European, Palearctic, Holarctic, Cosmopolitan (the shares of the particular zoogeographical groups in the *Collembola* fauna of the Karkonosze Mts are presented in Table II). The numerous group of fauna consists of species which live in European mountains and highlands: *Orogastrura parva*, *Schaefferia emucronata*, *S. willemi*, *Mesogastrura ojcoviensis*, *Ceratophysella cavicola*, *Neanura parva*, *Deutonura albella*, *D. conjuncta*, *Thaumanura carolii*, *Tetradontophora bielensis*, *Hymenaphorura dentifera*, *H. nova*, *Deharvengiurus denisi*, *Deuteraphorura cebennaria*, *D. silesiaca*, *Orthonychiurus stachianus*, *Tetracanthella brachyura*, *Hydroisotoma schaefferi*, *Isotoma pseudomaritima*, *Isotomurus palliceps*, *Orchesella alticola*, *Sminthurinus alpinus* and *S. gisini*.

The Boreal-montane element is made up of the following species: *Micranurida granulata*, *Tetracanthella fjellbergi*, *Pseudanurophorus binoculatus*, *Folsomia inoculata*,



*Vertagopus westerlundi* and *Arrhopalites principalis*. Another disjunctive element, the Arctic-montane, consists of *Folsomia sensibilis* and *Agrenia bidenticulata*.

Special attention must be paid to *Oligaphorura groenlandica*, which is the only representative of the circumpolar element. The distribution of this species is limited to the Arctic and scattered localities in mountains and lowlands, also in Poland (POMORSKI 1998).

At present, only one species can be regarded as a true endemite of the West Sude-tes. It is *Folsomia tesaři*, which is known from Karkonosze Mts and the adjacent Góry Izerskie Mts (DUNGER 1970a, b). *Uzelia dahli* – another potential endemite – was described in 1903 on the basis of a single specimen from the Karkonosze Mts and has never been confirmed since. Consequently, this species is regarded as *species dubia* (GISIN 1960). The other species which were not recorded outside Karkonosze Mts or West Sudetes, i.e. *Hypogastrura brevifurca*, *Hymenaphorura improvisa* and *Hymenaphorura parva*, have been described recently (SKARŻYŃSKI & POMORSKI 1996b, POMORSKI & SKARŻYŃSKI 2000, SKARŻYŃSKI 2000,) and, since their respective distributions are still unknown, should be regarded as neoendemites.

Table II. The shares of individual zoogeographical groups in the whole *Collembola* fauna of the Karkonosze Mts.

Zoogeographical groups of species	Number of species	%
Cosmopolitan	29	20
Holarctic	31	21.4
Palaearctic	18	12.4
European	27	18.6
Montane	23	15.9
Boreal-montane	6	4.1
Arctic-montane	2	1.4
Circumpolar	1	0.7
Endemic	1	0.7
Species of uncertain distribution	7	4.8
Total:	145	100.0

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[Tytuł: Skoczogonki (*Collembola*) Karkonoszy]

W polskiej części Karkonoszy stwierdzono występowanie 128 gatunków *Collembola*, w tym 5 nowych dla Sudetów i 41 nowych dla Karkonoszy. Łączna liczba gatunków *Collembola* występujących w Karkonoszach, włączając w to gatunki wykazywane z tego obszaru we wcześniejszych badaniach, wynosi 145. Wyróżniono sześć elementów zoogeograficznych w faunie *Collembola* Karkonoszy. Największą grupę stanowią gatunki szeroko rozsiadłe (europejskie, palearktyczne, holarktyczne, kosmopolityczne) i górskie. Pozostałe elementy (borealno-górski, arktyczno-górski, okołopolarny, endemiczny) reprezentowane są przez nieliczne gatunki. Fauna skoczogonków Karkonoszy wykazuje stosunkowo duże podobieństwo do fauny Sudetów Wschodnich. Na szczególną uwagę zasługują wyjątkowo bogate i zróżnicowane zgrupowania gatunków zasiedlających sztolnie, szczeliny skalne o charakterze jaskiń i epilitoralne rzek.