

Article

Parasitic arthropods of Soricinae shrews in north-eastern Poland. Supplementary data.

Grzegorz Karbowski^{1, 2*}, Michal Stanko³, Katerina Smahol^{1, 4}, Joanna Werszko^{1, 5} and Leszek Rychlik⁶

¹ W. Stefański Institute of Parasitology, Polish Academy of Sciences, 00-818 Warsaw, Poland; grzgrz@twarda.pan.pl

² University of Social and Medical Sciences in Warsaw, 04-367, Warsaw, Poland; g.karbowski@usmbm.edu.pl

³ Institute of Parasitology, Slovak Academy of Sciences, 040 01, Kosice, Slovak Republic; stankom@saske.sk

⁴ Museum and Institute of Zoology, Polish Academy of Sciences, 00-679 Warsaw, Poland; horizont1254@gmail.com

⁵ Department of General Biology and Parasitology, Medical University of Warsaw, 02-004 Warsaw, Poland; joanna.werszko@gmail.com

⁶ Department of Systematic Zoology, Institute of Environmental Biology, Faculty of Biology, Adam Mickiewicz University, 61-614 Poznań, Poland; rychliklesz@gmail.com

* Correspondence: g.karbowski@usmbm.edu.pl



Table S1. List of *Sorex araneus*, *Sorex minutus*, *Neomys fodiens*, *Neomys anomalus* ectoparasites in Central Europe, according to various authors. The borders of Central Europe according to Wojtanowicz [61] include:

Northern border- North Sea, Baltic;

Western border - Passage North Sea-Adriatic, Baltic – Black Sea; Rhine river;

Eastern border - Dniepr and Dvina rivers;

Southern border – Black Sea in the South-East, Danube and Sava rivers, ridge of the Alps in the South-West.

Classification after Wegner [16], Skuratowicz [12], Krasnov [62], Krantz and Walter [63], and Guglielmo et al. [25].

	<i>Sorex araneus</i> Linnaeus, 1758	<i>Sorex minutus</i> Linnaeus, 1766	<i>Neomys fodiens</i> (Pennant, 1771)	<i>Neomys anomalus</i> Cabrera, 1907.
Acari, Ixodidae				
<i>Dermacentor marginatus</i> (Sulzer, 1776)	Slovakia [50]			
<i>Dermacentor reticulatus</i> (Fabricius, 1794)	Slovakia [32,50-51,64]	Slovakia [50,64]		
<i>Haemaphysalis concinna</i> Koch, 1844	Austria [65], Slovakia [49,51,66]	Slovakia [49]		
<i>Ixodes apronophorus</i> (Schulze, 1924)	Poland [14,54,], Slovakia [67]		Poland [14]	
<i>Ixodes ricinus</i> (Linnaeus, 1758)	Germany [5,68], Poland [14, 29,57,69-73], Czech [74], Slovakia [45,51,66,75-76]	Poland [14,29,57,69], Austria [65], Czech [74], Slovakia [66]	Poland [14,29,72-73], Czech [74], Slovakia [77]	Poland [59], Czech [74], Slovakia [74,77]
<i>Ixodes trianguliceps</i> Birula, 1895	Germany [5,68,78], Poland [29,70,72-73], Austria [79], Slovakia [45-47,80-82]	Poland [29,57,70,72-73], Austria [65,79], Slovakia [45-47,66,81-83]	Poland [29,70], Austria [65] Slovakia [45,66,77]	Poland [70], Slovakia [75-77]

Acari, Ologamasidae

Cyrtolaelaps minor Willman, 1952: Poland [72-73], Slovakia [77,84-87]

Cyrtolaelaps mucronatus G. et R. Canestrini, 1881 Germany [88], Poland [29,70,72], Slovakia [46,77,84-86,90] Poland [29,57,72] Poland [29, 59, 72-73], Slovakia [77,83,85-86] Poland [59], Slovakia [36], Hungary [91]

Acari, Parasitidae

Androlaelaps fahrenholzi (Berlese, 1911) Poland [57,70], Czech [92 (as *Haemolaelaps glasgowi*)], Slovakia [89-90] Poland [59], Slovakia [77,85-86]

Androlaelaps sardous Berlese, 1911 Slovakia [85-86] Slovakia [85-86]

Eulaelaps stabularis C.L.Koch, 1836 Germany [88], Poland [29,57-58,70,73], Slovakia [82,84-86,89] Poland [29,58], Slovakia [84] Poland [58,73], Slovakia [77,85-86,89] Poland [58,70,73], Slovakia [36,86]

Haemogamasus ambulans (Thorell, 1872) Slovakia [15]

Haemogamasus bregetovae Mrciak, 1958 Poland [58] Poland [58] Poland [58] Poland [58]

Haemogamasus hirsutosimilis Willmann, 1952 Poland [58,70], Czech [92], Slovakia [93] Slovakia [93] Poland [29-58], Slovakia [85-87,93] Austria [94], Hungary [91]

Haemogamasus hirsutus Berlese, 1889 Poland [29,57-58,70-71,73], Czech [92], Slovakia [82,84,89] Poland [58,70], Slovakia [85] Poland [20, 32], Czech [92], Slovakia [36,77,85-86,93] Poland [85,73], Hungary [91]

Haemogamasus horridus Michael, 1892 Germany [88 (as *Eu-haemogamasus horridus*)], Poland [29,57-58,70,72-73], Austria [94], Slovakia [46,86] Poland [58,72], Slovakia [85-86,77] Poland [58,70], Slovakia [36], Hungary [91]

<i>Haemogamasus nidi</i> Michael, 1892	Poland [29,57,70-73], Austria [94], Slovakia [31,85-86,89,93]	Poland [70], Slovakia [93], Hungary [91]	Poland [72], Slovakia [36,77,85,87,89,93]	Poland [70,72-73], Slovakia [36,82,84-85], Hungary [91]
<i>Hirstionyssus isabellinus</i> (Oudemans, 1913) s. Evans et Till, 1966	Poland [29,57,70-71,73 (as <i>Echinonyssus isabellinus</i>)], Slovakia [30,46,76-77,82,84,95]	Slovakia [82,84]	Poland [72 (as <i>Echinonyssus isabellinus</i>)], Slovakia [93]	Poland [58]
<i>Hirstionyssus soricis</i> Turk, 1945	Poland [57,70-71, 73 (as <i>Echinonyssus soricis</i>)], Slovakia [82,84-85]	Poland [72,73 (as <i>Echinonyssus soricis</i>)], Slovakia [82,84]	Poland [29,73 (as <i>Echinonyssus soricis</i>)], Slovakia [77]	Poland [70,73 (as <i>Echinonyssus soricis</i>)], Slovakia [36,77], Hungary [91]
<i>Hirstionyssus sunci</i> Wang, 1962			Slovakia [77, 85, 93 (all as <i>H. apodemi</i>)]	
<i>Holoparasitus coronarius</i> Karg, 1971	Slovakia [84]			
<i>Holoparasitus excipulciger</i> (Berlese, 1905)	Slovakia [51]			
<i>Hyperlaelaps microti</i> (Ewing, 1953)	Poland [29,57,70-73], Czech [92 (as. <i>H. arvalis</i>)], Slovakia [85,93]	Poland [29,70], Slovakia [93]		Poland [70]
<i>Laelaps agilis</i> C.L.Koch, 1836	Poland [29,70,72-73], Austria [94], Slovakia [31,85-86,89,93,96]	Poland [29,73], Slovakia [31,86], Hungary [91]	Poland [29], Slovakia [36,85-86,77,93]	Poland [58], Slovakia [36,86,93], Hungary [91]
<i>Laelaps clethrionomydis</i> Lange, 1955	Slovakia [82,84-86,93,96]	Slovakia [82,84,93]	Slovakia [93]	Poland [58]
<i>Laelaps hilaris</i> Koch 1836	Poland [29,70-73], Austria [94], Czech [92], Slovakia [76-77,85-87,96]	Poland [29,70], Slovakia [82,84-87,93 42-45, 55]	Slovakia [77,85-86]	Poland [70], Slovakia [36]
<i>Laelaps jettmari</i> Vitzthum, 1930	Poland [57 (as <i>Laelaps pav-</i>			

	<i>lovskyi</i>], Slovakia [89]			
<i>Laelaps muris</i> (Ljungh, 1799)	Austria [94], Slovakia [93]		Czech [92]	
<i>Myonyssus ingricus</i> Bregetova, 1956	Poland [57,70], Austria [94], Slovakia [82,84,93]	Poland [70]	Slovakia [31,36,93]	Poland [70,73], Slovakia [36,93], Hungary [91]
Acari, Trombiculidae				
<i>Leptotrombidium europaeum</i> (Daniel and Brehl, 1959)	Poland [70], Slovakia [97]			
<i>Leptotrombidium silvaticum</i> (Huscha, Schluger, 1967)			Poland [58]	
<i>Trombicula (Neotrombicula) autumnalis</i> (Shaw, 1790)	Germany [88], Poland [57,71,73], Slovakia [97]	Poland [70]	Poland [70-73]	Poland [73]
<i>Neotrombicula inopinata</i> (Oudemans, 1909)	Poland [72-73], Slovakia [82,97]	Poland [57], Slovakia [97]	Poland [73]	Poland [59], Slovakia [45,75]
<i>Neotrombicula japonica</i> (Tanaka, Kaiwa, Teramura and Kagaya, 1930)	Poland [57]			
<i>Neotrombicula talmiensis</i> (Schluger, 1955)	Poland [70], Slovakia [98]		Poland [73,93]	Poland [99]
<i>Trombicula (Neotrombicula) zachvatkini</i> (Schluger, 1948)	Poland [57,72 as <i>Hirsutiella zachvatkini</i>]	Poland [57-70], Slovakia [45]	Poland [70]	
<i>Neotrombicula vulgaris</i> (Schluger, 1955)	Poland [99]		Poland [58]	
<i>Radfordia lemnina</i> (Koch, 1841)	Poland [57]			Poland [59]
Acari, Myobiidae				
<i>Myobia musculi</i> (Schranck, 1781)	Poland [57]			
<i>Protomyiobia onoi</i> Jameson and Dusbabek, 1971	Poland [71-73]			
<i>Protomyiobia claparedei</i> (Poppe,	Germany [88],			

1896)	Poland [71,73]			
Acari, Sarcoptiformes				
<i>Amorphacarus elongatus</i> (Poppe, 1896)	Germany [88, as <i>A. elongata</i>], Poland [70]			
<i>Myocoptes japonensis</i> (Radford, 1955)	Poland [27,57]		Poland [27,58]	
<i>Myocoptes musculus</i> (Koch, 1844)	Poland [27]	Poland [27]	Poland [27]	
<i>Trichoecius tenax</i> (Michael, 1889)	Poland [27,57]			
<i>Listrophorus brevipes</i> Dubinina, 1968	Poland [27]	Poland [27]	Poland [27]	
<i>Psorergates baueri</i> Lukoschus, de Cock, Driessen, 1971			Austria [100]	
Siphonaptera, Ceratophyllidae				
<i>Amalareus penicilliger</i> (Grube, 1851)	Poland [72], Austria [48], Slovakia [76,82,101-102]			
<i>Ceratophyllus hirundinis</i> (Curtis, 1826)	Czech [103]			
<i>Megabothris turbidus</i> (Rothschild, 1909)	Poland [26,72-73,104 (as <i>Ceratophyllus turbidus</i>), 105], Czech [44, 106], Slovakia [22,33,38]		Slovakia [33,101,107-108]	Poland [105] Slovakia [38,101,107-108]
<i>Megabothris walkeri</i> (Rothschild, 1902)	Poland [26,71, 104 (as <i>Ceratophyllus walkeri</i>)]	Poland [104 (as <i>Ceratophyllus walkeri</i>), Hungary [33,40]	Hungary [33,40]	
<i>Nosopsyllus fasciatus</i> (Bosc, 1800)	Slovakia [38,109], Hungary [110]		Hungary [110]	Slovakia [38]
Siphonaptera, Leptopsyllidae				

<i>Amphipsylla rossica</i> Wagner, 1912.		Czech [44]		
<i>Amphipsylla sibirica</i> (Wagner 1898)	Austria [48]			
<i>Leptopsylla segnis</i> (Schönherr, 1811)	Poland [26], Czech [44 (as <i>Ctenopsyllus segnis</i>)]			
<i>Peromyscopsylla bidentata</i> (Kolenati, 1860)	Austria [48], Czech [44 (as <i>Ctenopsyllus bidentatus</i>), 106], Slovakia [32,82,108], Hungary [110]	Slovakia [101]		Slovakia [101-102,107-108], Hungary [110]
<i>Peromyscopsylla fallax</i> (Rothschild, 1909)	Slovakia [101,107], Hungary [111]			Hungary [111]
<i>Peromyscopsylla silvatica</i> (Meinert, 1896)	Poland [26,57], Czech [103]			

Siphonaptera, Ctenophthalmidae

<i>Ctenophthalmus agyrtes</i> (Heller, 1896)	Germany [112], Poland [26,57,71,104-105,113], Austria [48,114], Czech [35,42,44,103,106], Slovakia [22,33,38,82,101-102] Hungary [33,40,110-111]	Poland [26,57,104-105], Czech [44], Slovakia [38,109,115]	Poland [26,104-105], Czech [42,44], Slovakia [82,101-102,107], Hungary [40,110]	Poland [105], Austria [48], Slovakia [38], Hungary [33,37,110]
<i>Ctenophthalmus assimilis</i> (Taschenberg, 1880)	Poland [26,57,71-72,104-105], Czech [35,42,44], Slovakia [22,33,38,101], Hungary [33,40,110]	Poland [104], Czech [44], Slovakia [38]	Poland [104-105], Czech [44], Slovakia [33,101,107], Hungary [33,40]	Slovakia [22,38], Hungary [110]
<i>Ctenophthalmus bisoctodentatus</i> Kolenati, 1863	Czech [44], Slovakia [101,107]		Poland [105]	

<i>Ctenophthalmus congerer</i> Rothschild, 1907	Poland [57], Austria [48]		Czech [44], Hungary [33]	
<i>Ctenophthalmus obtusus</i> Jordan et Rothschild 1912	Poland [113], Slovakia [116]		Poland [113]	
<i>Ctenophthalmus solutus</i> Jordan et Rothschild, 1920	Poland [105], Slovakia [38,107,101], Hungary [111,117]		Czech [44], Slovakia [101,107]	Slovakia [38,101,107]
<i>Ctenophthalmus uncinatus</i> (Wagner, 1898)	Poland [26,72], Slovakia [82,118]	Poland [72]	Slovakia [102]	
<i>Rhadinopsylla integella</i> Jordan et Rothschild, 1921	Austria [48], Czech (106), Slovakia [82,119]			
<i>Rhadinopsylla isacantha</i> (Rothschild, 1907)	Slovakia [120]			
<i>Rhadinopsylla mesoides</i> Smit, 1957	Slovakia [120]			
<i>Rhadinopsylla pentacantha</i> (Rothschild, 1897)	Slovakia [101,107], Hungary [117]			
Siphonaptera, Hystrichopsyllidae				
<i>Hystrichopsylla orientalis</i> Smit, 1956	Poland [26,60,105,113], Slovakia [82], Hungary [10-111,121]	Poland [60]	Poland [26,60,105], Slovakia [108]	Poland [60], Slovakia [115], Hungary [33,110,121]
<i>Hystrichopsylla talpae</i> (Curtis, 1826)	Poland [26,57,60,72,113], Austria [48,114], Czech [35,42,44,106], Slovakia [38,101]		Poland [60], Czech [42,44], Slovakia [101,107], Hungary [121]	
<i>Doratopsylla dasyncnema</i> (Rothschild, 1897)	Germany [112], Poland [26,57,72,105,113], Austria [48,114], Czech [35,42,44,103,106], Slovakia	Poland [26,113], Austria [48], Czech [35,42,44,103], Slovakia [38,101,107,109,115],	Poland [26,73,105,113], Czech [42,44,103], Slovakia [101-102,107,108], Hungary [33,110]	Czech [44], Slovakia [101,107-108], Hungary [33,110-111]

	[22,38,82,101-102,107,115], Hungary [33,110-111,117]	Hungary [87]		
<i>Palaeopsylla kohauti</i> Dampf, 1911	Austria [48,114], Czech (106), Slovakia [101,122], Hungary [33,110]		Slovakia [101-102]	Hungary [110]
<i>Palaeopsylla similis</i> Dampf, 1910	Czech [35,42,44,106], Slovakia [33,101,107,109]		Poland [105], Slovakia [101,107]	Slovakia [82,102,107]
<i>Palaeopsylla soricis</i> (Dale, 1878)	Germany [112], Poland [26,57,71-73,104-105,113], Austria [48,114], Czech [35,42,44,103,106], Slovakia [22,33,38,82,101,102,107,115], Hungary [75-76, 78-79, 87]	Poland [26,104-105,113], Austria [48], Czech [35,42,44], Slovakia [101,107,109,115]	Poland [26,72-73,104-105,113], Czech [42,44,103], Slovakia [82,101-102,107-108], Hun- gary [33,40,110-111]	Poland [26,72,105], Austria [48], Czech [44,103], Slovakia [22,38,82,101-102,107], Hungary [110]
<i>Palaeopsylla steini</i> Jordan 1932	Czech [44], Slovakia [82]		Slovakia [82]	
Anoplura				
<i>Hoplopleura acanthopus</i> (Burmeister, 1839)	Poland [57,71-73], Slovakia [83,123-125]	Poland [126], Slovakia [124]	Poland [127], Slovakia [124]	Poland [72], Slovakia [124]
<i>Hoplopleura affinis</i> (Burmeister, 1839)	Slovakia [81,124-125]	Slovakia [124-125]		
<i>Hoplopleura edentula</i> Fahrenholz, 1916	Poland [57,71,127], Slovakia [82,124]	Slovakia [124], Hungary [28]	Poland [59], Slovakia [124]	Poland [59], Slovakia [124]
<i>Polyplax reclinata</i> (Nitzsch, 1864)	Slovakia [128], Hungary [28]	Slovakia [128], Hungary [28]	Hungary [28]	
<i>Polyplax serrata</i> (Burmeister, 1839)	Poland [71-73,127], Slovakia [124-125]	Poland [73], Slovakia [124]	Poland [59], Slovakia [124]	