

Phoresy association between a pseudoscorpion (Arachnida: Pseudoscorpiones) and a crane fly (Diptera: Tipulidae) in the Czech Republic

Jana CHRISTOPHORYOVÁ¹ * and Pavel KRÁSENSKÝ²

1. Department of Zoology, Faculty of Natural Sciences, Comenius University in Bratislava, Mlynská dolina, Ilkovičova 6, SK-84215 Bratislava, Slovakia

2. Regional Museum and Gallery in Most, Čsl. armády 1360/35, CZ-43401 Most, Czech Republic

* Corresponding author, J. Christophoryová, E-mail: christophoryova@gmail.com

Received: 02 September 2021 / Accepted: 02 November 2021 / Available online: April 2022 / Printed: June 2022

Abstract. The phoresy association between pseudoscorpion *Chernes cimicoides* (Fabricius, 1793) and crane fly *Dictenidia bimaculata* (Linnaeus, 1761) was documented in the Czech Republic. A pseudoscorpion was attached to the tibia of the second leg of a crane fly in a beech forest. This finding represents the first record of the phoront, as well as its host, in the Czech Republic.

Keywords: Central Europe, *Chernes cimicoides*, Czech Republic, *Dictenidia bimaculata*, host, phoront

Phoresy represents a dynamic, intraspecific, and temporary relationship, during which a phoront is attached to a host for the purpose of transportation from one habitat to another; therefore, the primary result is dispersion (Camerik 2010). Barlow & Agosta (2020) summarised published data about phoresy from 1900 to 2020, and the results showed that phoresy was observed in animals belonging to 13 phyla, 24 classes, and 60 orders; most of these observations were small invertebrates. There are two hypotheses about phoresy origins in pseudoscorpions. One is that phoresy is only accidental, motivated by hunger, and a consequence of unsuccessful predation (predation hypothesis; e.g., Vachon 1940, Muchmore 1971). The second hypothesis (dispersion hypothesis; e.g., Beier 1948, Legg 1975, Poinar et al. 1998) considers phoresy as an active search for a host, which is used by pseudoscorpions for their dispersal. Pseudoscorpions can attach to other more mobile arthropods, small mammals, or birds. The benefit for pseudoscorpions is to reach a new habitat, even less stable ones, with a potential food supply, thus increasing their potential distribution (Poinar et al. 1998). Recent phoretic records include hosts from eight insect orders (Odonata, Orthoptera, Hemiptera, Mecoptera, Coleoptera, Diptera, Lepidoptera, Hymenoptera) and two arachnid orders (Araneae, Opiliones) (Poinar et al. 1998, Christophoryová et al. 2017b). In most recorded cases, only adults of pseudoscorpions were involved, but there are some rare cases where nymphs were also attached to the hosts (Sankey 1949, Jones 1978, Poinar et al. 1998, Lira & Tizo-Pedroso 2017). Pseudoscorpions use only one pedipalp, rarely both, for attachment (Jones 1978, Lira et al. 2014). Most commonly, they attach to the appendages of carriers, such as their legs (Christophoryová et al. 2017a, 2017b, 2021; Červená et al. 2019), antennae (Červená et al. 2019, Bevilaqua et al. 2020), proboscis (Krajčovičová et al. 2017), tergites, sternites (Poinar et al. 1998, Lira et al. 2014, Lira & Tizo-Pedroso 2017), or are hiding under elytra (Muchmore 1971, 1972; Aguiar & Bührnheim 1998).

In the Czech Republic, there are several published cases of phoresy, all from the South Moravian Region. Minář (1966) found three mosquitoes (Diptera: Culicidae) with attached pseudoscorpions *Lamprochernes nodosus* (Schrank, 1803) on their legs. The pseudoscorpion *Dendrochernes cyrneus* (L. Koch, 1873) was associated with the legs of

several beetles (Coleoptera: Cerambycidae, Scarabaeidae; Ducháč 1993, Šťáhlavský & Chytil 2013). The last case was documented by Christophoryová et al. (2017b), and it represents the first record of a scorpionfly as a host worldwide. The pseudoscorpion *Dinocheirus panzeri* (C. L. Koch, 1837) was attached to the second leg of the common scorpionfly (Mecoptera: Panorpidae; Christophoryová et al. 2017b).

In the present paper, the phoresy between pseudoscorpion *Chernes cimicoides* (Fabricius, 1793) and crane fly *Dictenidia bimaculata* (Linnaeus, 1761) was documented in the Czech Republic for the first time (Figure 1A). One pseudoscorpion (sex was impossible to identify) was attached to the tibia of the second leg of a crane fly (Figure 1).

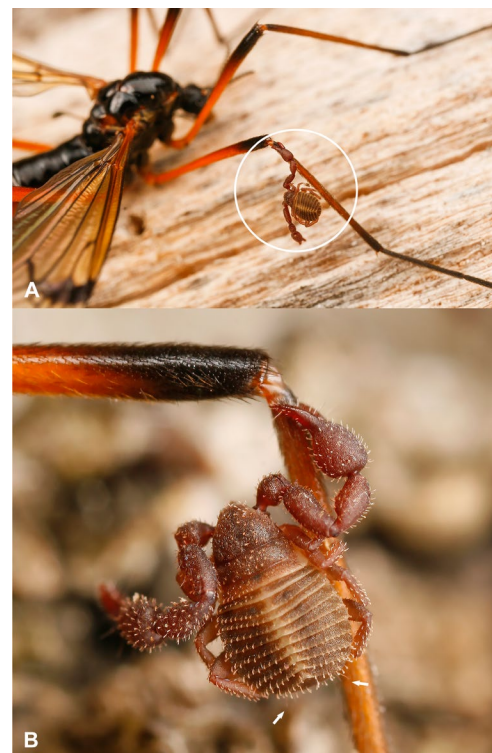


Figure 1. A. Pseudoscorpion *Chernes cimicoides* attached to the leg of a crane fly *Dictenidia bimaculata*. B. Detail of the pseudoscorpion, arrows point to tactile setae on tergite XI (Photographs: Pavel Krásenský).

Material examined (Figure 1)

Czech Republic: Ore Mountains, Chomutov, Bezručovo údolí Nature Park (50.50469°N, 13.32772°E; 583 m a.s.l.): 29 May 2008: 1 ♀ of *Dictenidia bimaculata* (det. Jozef Oboňa and Jaroslav Starý) with attached adult of *Chernes cimicoides* (det. Jana Christophoryová); beech forest, felled area.

Diagnosis

The pseudoscorpion was photographed; both host and phoront were not captured. Due to the quality of the photograph, the specimen could be identified. According to the palpal chela shape, carapace shape, and body setae type, the specimen belongs to the Chernetidae family and the genus *Chernes* Menge, 1855. In the photograph, two tactile setae were visible on the last tergite (Figure 1B). Of the Czech chernetid pseudoscorpions (Červená et al. 2020), two species from the genus *Chernes* have tergite XI with a pair of tactile setae – *Chernes cimicoides* and *Chernes nigrimanus* Ellingsen, 1897. *Chernes nigrimanus* has a chelal hand that is distinctly darker than other palpal segments (the chelal hand of *C. cimicoides* is the same colour as other palpal segments, Figure 1B). The main diagnostic characteristic that differs between these species is the surface of palps and the carapace distal to the subbasal transverse furrow, which is granulated in *C. nigrimanus* and has a honeycomb pattern in *C. cimicoides* it (Figure 1B; Christophoryová et al. 2011).

There are several known cases of phoresy between Tipulidae and Chernetidae in Europe; the host has primarily been the crane fly *Ctenophora pectinicornis* (Linnaeus, 1758) (summarized in Poinar et al. 1998). Two specimens of *Chernes cimicoides* were also attached to the legs of this host (Wagner 1892). Bloxham & Smart (2001) recorded *Chernes cimicoides* attached to *Dictenidia bimaculata* in England, United Kingdom. An interesting finding was from Sweden showed one female *C. pectinicornis* with around 40 specimens of another chernetid species, *Anthrenochernes stellae* Lohmander, 1939, on its legs (Gärdenfors & Wilander 1995). In other insect orders, *C. cimicoides* was phoretic on the ichneumon wasp (Hymenoptera: Ichneumonidae; Jones 1978).

The present record represents the first observation of *C. cimicoides* attached to *Dictenidia bimaculata* in the Czech Republic.

Acknowledgement

We are thankful to our colleagues Jozef Oboňa and Jaroslav Starý for identification of the host. We are grateful to our colleagues Anna Šestáková and Gabriel A. Villegas-Guzmán for their valuable and constructive comments that improved the paper. The study was financially supported by a VEGA grant 1/0704/20.

References

Aguiar, N.O., Bührnheim, P.F. (1998): Phoretic pseudoscorpions associated with flying insects in Brazilian Amazônia. *Journal of Arachnology* 26: 452-459.

Barlow, A.W., Agosta, S.J. (2020): Phoresy in animals: review and synthesis of a common but understudied mode of dispersal. *Biological Reviews* 96: 223-246.

Beier, M. (1948): Phoresie and Phagophilie bei Pseudoscorpionen. *Österreichische Zoologische Zeitschrift* 1: 441-497.

Bevilaqua, M., Soares, M.M.M., García, F. (2020): First record of phoretic association between *Cordylochernes scorpoides* (Linnaeus) (Pseudoscorpiones: Chernetidae) and *Hylettus coenobita* (Erichson) (Coleoptera: Cerambycidae) in central Amazon. *Revista Chilena de Entomología* 46: 387-392.

Bloxham, M.G., Smart, M.J. (2001): Some interesting South Staffordshire insect sites. In: *Dipterists Day Exhibits 2000* - compiled by Editor from exhibitor's notes. *Dipterists Digest* 8: 7-9.

Camerik, A.M. (2010): Phoresy revisited. pp. 333-336. In: Sebelis M., Bruin J. (eds.) *Trends in Acarology*. Springer.

Christophoryová, J., Červená, M., Krajčovičová, K. (2021): New records of phoretic associations between pseudoscorpions and their hosts in Slovakia (Pseudoscorpiones: Atemnidae, Chernetidae). *Arachnologische Mitteilungen* 61: 24-26.

Christophoryová, J., Gruša, D., Krajčovičová, K. (2017a): New records of pseudoscorpions (Arachnida: Pseudoscorpiones) associated with animals and human habitats in Slovakia and the Czech Republic. *Arachnologische Mitteilungen* 53: 67-76.

Christophoryová, J., Nováková, M., Kautman, M., Krajčovičová, K. (2017b): First record of a phoresy between a scorpionfly and a pseudoscorpion (Mecoptera, Panorpidae and Arachnida, Pseudoscorpiones). *Spixiana* 40: 68.

Christophoryová, J., Štáhlavský, F., Fedor, P. (2011): An updated identification key to the pseudoscorpions (Arachnida: Pseudoscorpiones) of the Czech Republic and Slovakia. *Zootaxa* 2876: 35-48.

Červená, M., Kirchmair, G., Christophoryová, J. (2019): Phoretic chernetid species newly recorded from Slovakia and Austria (Pseudoscorpiones: Chernetidae). *Arachnologische Mitteilungen* 57: 65-68.

Červená, M., Krajčovičová, K., Christophoryová, J. (2020): Updated checklist of pseudoscorpions (Arachnida: Pseudoscorpiones) of Central Europe. *Arthropoda Selecta* 29: 219-228.

Ducháč, V. (1993): Zwei neue Afterskorpion-Arten aus der Tschechischen Republik. *Arachnologische Mitteilungen* 5: 36-38.

Gärdenfors, U., Wilander, P. (1995): Ecology and phoretic habits of *Anthrenochernes stellae* (Pseudoscorpionida, Chernetidae). *Bulletin of the British Arachnological Society* 10: 28-30.

Jones, P.E. (1978): Phoresy and commensalism in British Pseudoscorpions. *Proceedings and Transactions of the British Entomological and Natural History Society* 1978: 90-96.

Krajčovičová, K., Christophoryová, J., Mahnert, V. (2017): *Rhacochelifer disjunctus* (Pseudoscorpiones: Cheliferidae) new to the fauna of Slovakia. *Arachnologische Mitteilungen* 53: 38-42.

Legg, G. (1975): The possible significance of spermathecae in pseudoscorpions (Arachnida). *Bulletin of the British Arachnological Society* 3: 91-95.

Lira, A.F.A., Tizo-Pedroso, E. (2017): Report of *Sphenochernes camponoti* (Beier, 1970) (Pseudoscorpiones, Chernetidae) in phoresy on Fanniidae (Diptera). *Acta Scientiarum, Biological Sciences* 39: 449-454.

Lira, A.F.A., Tizo-Pedroso, E., Albuquerque, C.M.R. (2014): Phoresy by *Americhernes* aff. *incertus* (Pseudoscorpiones: Chernetidae) on a tropical fly *Fannia canicularis* (Diptera: Fanniidae) in a fragment of the Atlantic Forest, Brazil. *Entomological News* 124: 24-28.

Minář, J. (1966): Phoresia of *Damalinea* (C.) *meyeri* (Mallophaga) and *Lamprochernes nodosus* (Pseudoscorpionidea) on mosquitoes *Aedes sticticus* (Culicidae). *Folia Parasitologica* 13: 270-273.

Muchmore, W.B. (1971): Phoresy by North and Central American pseudoscorpions. *Proceedings of the Rochester Academy of Science* 12: 79-97.

Muchmore, W.B. (1972): A phoretic *Metatemnus* (Pseudoscorpionida, Atemnidae) from Malaysia. *Entomological News* 83: 11-14.

Poinar, G.O. Jr., Čurčić, B.P.M., Cokendolpher, J.C. (1998): Arthropod phoresy involving pseudoscorpions in the past and present. *Acta Arachnologica* 47: 79-96.

Sankey, J.H.P. (1949): Observations on the food, enemies and parasites of British harvest-spiders (Arachnida, Opiliones). *Entomologist's Monthly Magazine* 85: 246-247.

Štáhlavský, F., Chytil, J. (2013): Pseudoscorpions (Arachnida: Pseudoscorpiones) of the Lower Morava Biosphere and adjacent localities (Czech Republic). *Klapalekiana* 49: 73-88.

Vachon, M. (1940): Remarques sur la phoresie des Pseudoscorpions. *Annales de la Société Entomologique de France* 109: 1-18.

Wagner, F. (1892): *Biologische Notiz*. *Zoologischer Anzeiger* 15: 434-436.