# New records of phoretic associations between pseudoscorpions and their hosts in Slovakia (Pseudoscorpiones: Atemnidae, Chernetidae)

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# New records of phoretic associations between pseudoscorpions and their hosts in Slovakia (Pseudoscorpiones: Atemnidae, Chernetidae)

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**Abstract.** New cases of phoresy of pseudoscorpions (Pseudoscorpiones: Atemnidae, Chernetidae) are recorded from Slovakia. The phoresy of the species *Atemnus politus* (Simon, 1878) involving owlet moth (Noctuidae) as a host is documented for the first time not only in Slovakia, but also worldwide. One phoretic female of *Lamprochernes chyzeri* (Tömösváry, 1883) was attached to the leg of a lance fly (Lonchaeidae). It represents the second known phoresy of the species from Slovakia and the record of a new host.

**Keywords:** Central Europe, Diptera, lance fly, Lepidoptera, owlet moth, phoresy

**Zusammenfassung. Neue Nachweise phoretischer Beziehungen zwischen Pseudskorpionen und ihren Wirten aus der Slowakei (Pseudoscorpiones: Atemnidae, Chernetidae).** Neue Phoresie-Fälle bei Pseudoskorpionen wurden in der Slowakei verzeichnet (Pseudoscorpiones: Atemnidae, Chernetidae). Die Beobachtung der Phoresie der Art *Atemnus politus* (Simon, 1878) an einem Eulenfalter (Noctuidae) ist nicht nur die erste in der Slowakei sondern auch weltweit. Ein phoretisches Weibchen von *Lamprochernes chyzeri* (Tömösváry, 1883) hatte sich an das Bein einer Lanzenfliege (Lonchaeidae) gehängt. Dies ist der zweite Fall von Phoresie der Art in der Slowakei und der Nachweis eines neuen Wirtes.

Phoresy is a non-permanent interaction in which one organism (a phoront) attaches itself to another (the host). Pseudoscorpions attach themselves to mobile animals and subsequently disperse into new habitats (White et al. 2017). Species hide under the elytra, among the feathers or fur or they grasp the extremities, sternites, or other body parts of the hosts (e.g. Jones 1978, Zeh & Zeh 1992, Carl 1994). There exist two hypotheses about the evolution of pseudoscorpion phoresy (summarized in Zeh & Zeh 1992). Some authors regard pseudoscorpion phoresy as a behaviour primarily aimed at dispersal (the dispersal hypothesis; e.g. Beier 1948, Weygoldt 1969, Legg 1975). Others argue that the phoresy is the accidental by-product of unsuccessful predation (the predation hypothesis; e.g. Vachon 1940, 1953, Muchmore 1971). In Europe, the most common phoretic associations are between pseudoscorpions and insects and are mostly known from the families Chernetidae and Cheliferidae (Poinar et al. 1998).

In Slovakia, several phoretic associations were recorded. Mašán & Krištofík (1992) collected two males of *Lamprochernes nodosus* (Schrank, 1803) on two species of Diptera using the traps baited with decaying meat or faeces. A male of *Lamprochernes chyzeri* (Tömösváry, 1883) was attached to Diptera (Christophoryová et al. 2011b) and a female of *Rhacochelifer euboicus* Mahnert, 1977 was found in a Malaise trap phoretic on Lepidoptera (Krajčovičová et al. 2017, Hernández-Corral et al. 2018). Christophoryová et al. (2017) recorded several phoretic associations of females of *Allochernes peregrinus* Lohmander, 1939 and *Lamprochernes* sp. on Diptera. Multiple phoresies of *L. nodosus* on Diptera were documented from Slovakia by Christophoryová et al. (2018); one to five females were attached to the hosts. The latest cases of phoresy by chernetids were evidenced by Červená et al. (2019). Pseudoscorpion phoresy involving Heteroptera as a host was recorded for the first time in Slovakia (a female of *L. nodosus*), as well as a case of phoresy by the species *Pselaphochernes scorpioides* (Hermann, 1804) (Červená et al. 2019).

Summarizing all above-mentioned published data, five pseudoscorpion species are known to be phoretic on Diptera, Heteroptera and Lepidoptera in Slovakia. In the present study, three new records of phoretic associations between pseudoscorpions and their hosts from Slovakia are documented.

## Material and methods

Pseudoscorpions and their hosts were collected using Malaise traps at the locality of Virt in Slovakia (leg. J. Kodada, S. Krčmárik, D. Selnekovič). All pseudoscorpions were studied as temporary slide mounts using lactic acid and then rinsed in the water and returned to 70% alcohol. The pseudoscorpion specimens were identified using the key in Christophoryová et al. (2011a). Hosts were identified only to genus level by specialists as mentioned in the Results part. Digital photographs were taken using a Canon EOS 5D Mark II camera attached to a Zeiss Axio Zoom V16 stereomicroscope. Image stacks were produced manually, combined using the Zerene Stacker software and subsequently edited in Adobe Photoshop CC. The material is deposited in the zoological collection at the Department of Zoology, Comenius University in Bratislava.

## Results

SLOVAKIA, Virt, sand dune, Malaise trap in *Robinia pseudoacacia* L. and *Gleditsia triacanthos* L. (47.76066°N, 18.33747°E; 125 m a.s.l.), 13. Sep. 2018, 1 ♀ of *Atemnus politus* (Simon, 1878) on Ta III of owlet moth (Lepidoptera: Noctuidae, *Euxoa* Hübner, 1821; det. J. Šumpich; Fig. 1).

SLOVAKIA, Virt, sand dune, Malaise trap in managed meadow (47.76316°N, 18.34019°E; 113 m a.s.l.), 17. Jul. 2019, 1 ♀ of *Lamprochernes chyzeri* (Tömösváry, 1883) on Fe III of lance fly (Diptera: Lonchaeidae, *Lonchaea* Fallen, 1820; det. M. Tkoč and I. MacGowan; Fig. 2).

SLOVAKIA, Virt, sand dune, Malaise trap in unmanaged vineyard (47.76052°N, 18.33591°E; 120 m a.s.l.), 27. Aug. 2019, 1 ♀ and 1 ♂ of *Atemnus politus* on Ta I and Ta II of owlet moth (Lepidoptera, Noctuidae, *Euxoa*; det. J. Šumpich; Fig. 3).

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**Fig. 1:** *Atemnus politus* attached to the leg of an owlet moth from Slovakia. Scale bar: 1 mm

**Fig. 2:** *Lamprochernes chyzeri* attached to the leg of a lance fly from Slovakia. Scale bar: 1 mm

## Discussion

To the best of our knowledge, the phoresy of *Atemnus politus* is documented here for the first time not only in Slovakia but worldwide. Records of pseudoscorpions on moths are exceedingly rare, and this applies also to atemnids. Only Beier (1930) recorded adults of *Diplotemnus balcanicus* (Redikorzev, 1928) taken from moths attracted to light in Algeria [as *Atemnus piger* (Simon, 1878)]. For atemnids, the majority of phoresies are known on hosts from Coleoptera, Hemiptera or Hymenoptera (e.g. Beier 1932, 1948, Muchmore 1971, 1972, Aguiar & Bührnheim 1998, Poinar et al. 1998).

A phoresy of a male of *Lamprochernes chyzeri* was observed in Slovakia on Diptera, Muscidae (Christophoryová et al. 2011b). From Europe, only a few phoresy cases of this species were recorded. Vachon (1954) found the species attached to Lepidoptera and Meinertz (1964) on Diptera, Muscidae. Jones (1978) published an attachment to Diptera, Lonchaeidae. Legg & Jones (1988) mentioned that the species is phoretic on flies and Drogla & Lippold (2004) recorded seven phoretic specimens without specific hosts.


**Fig. 3:** *Atemnus politus* attached to the legs of an owlet moth from Slovakia. **a.** Both specimens attached to the host; **b.** Detail of attachment. Scale bar for b: 1 mm

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