The predatory rhagidiid mites (Acari: Prostigmata: Rhagidiidae) in stony debris

Räuberische Milben (Acari: Prostigmata: Rhagidiidae) in Blockhalden

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Abstract: Twentyeight known and eight new species of rhagidiid mites were collected in the stony debris in the territory of the Czech Republic and in the Oetztal Alps, Tyrol, Austria. The stony debris, as a habitat, is estimated in the aspects of taxonomy, ecology, biogeography and evolution of the rhagidiid mites.

Keywords: Acari, Rhagidiidae, biodiversity, stony debris (block fields)

Kurzfassung: Achtundzwanzig bekannte und acht neue Milben-Arten (Rhagidiidae) konnten in Blockhalden auf dem Territorium der Tschechischen Republik und in den Ötztaler Alpen in Tirol, Österreich, gesammelt werden. Die Blockhalden werden als Habitat im Hinblick auf Taxonomie, Ökologie, Biogeographie und Evolution der Milben beurteilt.

Schlagworte: Acari, Rhagidiidae, Biodiversität, Blockhalden

1. Introduction

Predatory soil mites of the family Rhagidiidae are world-wide in distribution and inhabit various ecosystems. However, they prefer rather cool and moist habitats (STRANDTMANN 1971, ZACHARDA 1980, 1993). They may also be frequently found in high altitudes or high latitudes above timberline in uppermost parts of alpine, subnival and low nival zones with severe climatic conditions. They occur under stones and in wet stony debris in shaded ground depressions frequently covered with snow or containing ice as late as in mid-summer (ZACHARDA 1994). These habitats support a little-known subterranean fauna and can also be important refuges for glacial relict species in the more southern parts of the Palearctic region.

2. Material and methods

Large pitfall traps made of rigid plastic, about 13 cm high and 10.5 cm in diameter (RUZICKA 1988), were positioned approximately 50-100 cm under the surface of stony debris. The traps contained a mixture of 7 % formalin and 20 % glycerol plus a few drops of detergent. They were left in place for 1 year, after which they were removed and the catch processed in the laboratory. Mites were also collected by a method of hand-sorting using a small aspirator containing ethanol as a preservative. Mites were mounted in lactic acid in temporary microscopic preparations and examined under a standard light microscope (KRANTZ 1978).

The rhagidiid mites were collected in the stony debris in 51 localities in the territory of the Czech Republic (North Bohemia: the Krkonoše Mts, Ceské stredohorí Mts, Adrsbasské and Teplické skály – rocks and caves; Central Bohemia: slopes of the Berounka river valley near the castle of Krivoklát; South Bohemia: the Sumava National Park; North Moravia: the Jeseníky Mts; South Moravia: slopes of the Dyje river valley and the Moravian Karst near Blansko). Similarly they were also collected in stony debris in the Oetztal Alps, Tyrol, Austria and near Filàkovo, Slovakia.

3. Results

To date, 28 species of rhagidiid mites were collected in the stony debris. They are listed in the Table 1. Moreover, 8 new species were discovered and their diagnoses and descriptions will be published soon. The assemblage of species collected in the stony debris can be estimated in a few different, but coherent taxonomic, ecological, biogeographic and evolutionary aspects.

In the aspect of taxonomy, the stony debris are inhabited by still undiscovered new species of the rhagidiid mites.

In the aspect of ecology, the communities of rhagidiid mites that inhabit dry, hot xerothermic stony debris differ from those inhabiting cool and moist stony debris. The former type of the stony debris is inhabited by species which are eco-physiologically adapted to a dry and hot summer season: they complete their season-dependent life

cycles from autumn to spring. These mites disappear during summer and survive this unfavourable season in an egg-diapause (EHRNSBERGER 1977, ZACHARDA 1980). For example, they are *Rhagidia diversicolor*, *Thoria brevisensilla*, *Evadorhagidia oblikensis*, *Foveacheles osloensis*, etc.

In contrast, the cool and moist stony debris are inhabited by rhagidiids which have either season-independent or season-dependent life cycles which are completed from spring to late summer. For example, such type of the life cycle can be encountered in the arctic *Rhagidia gelida*.

In the aspect of biogeography, in central Europe the cool and moist stony debris serve as refuges for many boreo-alpine or troglophilous rhagidiids. For example, *Rhagidia gelida* and *Poecilophysis recussa* have been known only from the arctic tundra of the Holarctic and Palearctic regions, respectively (ZACHARDA 1980, 1993) and from cool stony debris in the Krkonoše, Ceské stredohorí and Jeseníky Mts. *Foveacheles terricola* has been collected only in caves in Franconian Jura, Swabian Alb, Germany, in a cave in the Austrian Vorarlberg and in stony debris in central Bohemia. Further examples could be presented.

In the aspect of evolution, the stony debris can be considered to be a gateway for an adaptive evolution of troglobitic rhagidiid mites. A few different groups of species of the rhagidiids have been collected recently in the stony debris and they exhibit sympatric adaptive evolutionary trends directed towards troglobitic life and respective morphological adaptations, troglomorphisms (ZACHARDA 1979, 1980). For example, they are *Poecilophysis recussa* and *P. spelaea*, cf. (ZACHARDA 1993) or a group of the closely related new species of the genus *Troglocheles,* collected in the stony debris in the Oetztal Alps, Tyrol.

Table 1: A list of species of the Rhagidiidae collected in the stony debris

Coccorhagidia pittardi STRANDTMANN, 1971

Evadorhagidia bezdezensis ZACHARDA, 1980
E. oblikensis ZACHARDA, 1980
E. oblikensis corcontica ZACHARDA, 1993
E. janetscheki (WILLMANN, 1953)
E. sp.n. 1
E. sp.n. 2
E. sp.n. 3

Foveacheles unguiculata ZACHARDA, 1994
F. brevichelae ZACHARDA, 1980
F. cegetensis ZACHARDA, 1983
F. terricola (C.L.KOCH, 1835)
F. osloensis (THOR, 1934)
F. sp.n. 1
F. sp.n. 2
F. sp.n. 3

Poecilophysis faeroensis (TRÄGARDH, 1931)
P. pseudoreflexa ZACHARDA, 1980
P. wankeli (ZACHARDA, 1978)
P. spelaea (WANKEL, 1861)
P. pratensis (C.L.KOCH, 1835)
P. saxonica (WILLMANN, 1934)
P. recussa (THOR, 1909)
P. weyerensis (PACKARD, 1888)

Rhagidia parvilobata ZACHARDA, 1995
R. gigas (CANESTRINI, 1886)
R. distisolenidiata ZACHARDA, 1995
R. diversicolor (C.L.KOCH, 1838)
R. gelida THORELL, 1872
R. breviseta ZACHARDA, 1995
R. punkva ZACHARDA, 1980

Shibaia tatrica ZACHARDA, 1980

Thoria uniseta (THOR, 1909)
T. brevisensilla ZACHARDA, 1980

Troglocheles sp.n. 1
T. sp.n. 2

4. Future prospects

Discoveries of further new species or glacial relicts are expected particularly in cool and moist stony debris containing permafrost or ice during summer months. At least 15 localities with ice in summer are known to exist in the Czech Republic. Most of them are located in the Ceské stredohorí Mts, North Bohemia (KUBÁT 1971). The biodiversity of invertebrates has never been examined in these curious biotopes.

References

EHRNSBERGER, R. (1977): Fortpflanzungsverhalten der Rhagidiidae (*Acarina Trombidiformes*). - Acarologia **19**, 67-73

KRANTZ, G.W. (1978): A manual of acarology. Second edition. (Corvallis, Oregon: O.S.U. Book Stores, Inc.). 509 S.

KUBÁT, K. (1971): Ledové jámy a exhalace v Ceském stredohorí II. -Vlastivedný Sborník 1971 Litomericko **8**, 67-89

RUZICKA, V. (1988): The longtimely exposed rock debris pitfalls.- Vestník Ceskoslovenské Spolecnosti Zoologické **52**, 238-240

STRANDTMANN, R.W. (1971): The eupodoid mites of Alaska (Acarina : Prostigmata). - Pacific Insects **13**, 75-118

ZACHARDA, M. (1979): The evaluation of the morphological characters in Rhagidiidae. - in: RODRIGUEZ, J.G.: Recent advances in acarology. Proceedings of the 5th International Congress of Acarology, East Lansing, Michigan, 1978. Vol. **2** (Acad. Press, New York)

ZACHARDA, M. (1980): Soil mites of the family Rhagidiidae (Actinedida: Eupodoidea). Morphology, systematics, ecology. - Acta Universitatis Carolinae Biologica 1978, **5-6**, 489-785

ZACHARDA, M. (1993): Glacial relict Rhagidiidae (Acari: Prostigmata) from superficial underground enclosures in the Krkonoše Mountains, Czechoslovakia. - Journal of Natural History **27**, 47-61

ZACHARDA, M. (1994): *Foveacheles unguiculata* n. sp., a new rhagidiid mite from the Central Alps (Tyrol, Austria) (Acari : Prostigmata : Rhagidiidae). - Ber. nat-med. Verein Innsbruck **81**, 85-91

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Zeitschrift/Journal: Decheniana

Jahr/Year: 1999

Band/Volume: BH_37

Autor(en)/Author(s): Zacharda Miloslav

Artikel/Article: The predatory rhagidiid mites (Acari: Prostigmata: Rhagidiidae) in stony debris - Räuberische Milben (Acari: Prostigmata: Rhagidiidae) in Blockhalden 149-151