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Turcibates parvus (Acarina, Oribatida), a steppe relict in Central Europe?

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Zusammenfassung

Turcibates parvus (Acarina, Oribatida), ein Steppenrelikt in Mitteleuropa?
Die Hornmilbe *Turcibates parvus* wurde im Boden eines Langzeitversuchs zur Umstellung von konventionellen auf ökologischen Landbau im Marchfeld (Niederösterreich) festgestellt. Es ist der erste Nachweis der Art in Zentraleuropa und der dritte außerhalb Asiens. Obwohl ihre Nomenklatur noch nicht völlig geklärt ist, dürfte sie eine disjunkte turano-ponto-mediterrane Verbreitung haben, also nur kleinräumig zwischen Spanien und Kasachstan verbreitet sein. Das Marchfeld bildet vermutlich das nördlichste Vorkommen. Alle Nachweise der Art stammen von semiariden bis halbwüstenartigen Klimaten mit Steppenvegetation. *Turcibates parvus* ist im Marchfeld wahrscheinlich autochthon: eine Reliktform der ehemaligen Steppebedingungen dieser Region.

Abstract

The oribatid mite *Turcibates parvus* was collected from the soil of a long term conversion experiment from conventional to organic agriculture in the Marchfeld, Lower Austria. It is the first record of this species in Central Europe and the third one outside Asia. Its nomenclature is not fully resolved, however, it seems to have a disjunct turano-ponto-mediterranean distribution, that is, occurs patchily from Spain to Kazakhstan. The Marchfeld presumably is the northernmost locality of its range. All records of the species are from semiarid to semi desert climates with low precipitation and predominant steppe vegetation. *Turcibates parvus* is probably native to the Marchfeld, being a relict species of the historic steppe conditions in this region.

Keywords: Oribatida, biogeography, steppe, faunistics

Introduction

The Marchfeld is a lowland east of Vienna, Austria, and has an area of roughly 1000 square kilometres. Geographically, it forms the westernmost part of the Pannonian Basin, a flat agricultural landscape west of the Carpathian Mountains. The climate of the basin is semiarid and characterized by low precipitation, cold winters and hot, dry summers. Evaporation exceeds precipitation in many years, so that desertification is a potential threat for land use ("Versteppung"; for the Marchfeld, see Österreichische Bodenkartierung 1971-1980, Harlfinger & Knees 1999). There has been much debate among botanists on the aspect of vegetation prior to the arrival of man (see Rötzer 2004 for an overview), however, at least in historic times, much of the Pannonian Basin had been a steppe. "Steppe" is defined here broadly as an open landscape dominated by grasses in continental dry regions, with livestock grazing as the predominant form of cultivation.
Agriculture in the Marchfeld varied considerably over the centuries, and was quite

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different from today (RÖTZER 2004). Pasture economy of the grasslands seems to have been important at all times in history. In the eighteenth century, a strong economic demand for enhanced productivity resulted in overgrazing of vast areas and many farmers attempted to convert the sandy pastures into fields. This created dunes of drifting sand by wind erosion that devastated much ground in the following centuries, and formed an enduring impediment for agriculture. Beginning around 1770 and continuing until the late fifties of the twentieth century, authorities fought the drifting sand by large scale afforestation of dunes, and, from the sixties onwards, by planting linear hedgerows that still shape the landscape. Previously small and variously cultivated fields were consolidated to economize their cultivation from 1890 onwards ("Kommassierung").

Today, the Marchfeld is one of the most intensively managed and uniform agricultural regions of Austria. Ploughing of even shallow and sandy soils is possible due to heavy irrigation, irrespective of the low precipitation in the region. Pastures have virtually disappeared. The old steppe and dunes are restricted to a handful of small and critically endangered remnants. They still house a flora and fauna of very high conservation value (e.g. WIESBAUER & MAZZUCCO 1997).

Here I report the soil dwelling mite *Turcibates parvus* from the Marchfeld, which is the first record of the species in Central Europe and the second one outside Asia. The geographical distribution of the species indicates an element of steppes and semi deserts in the mediterranean, pontic, and turanic regions of Eurasia. The Austrian population seems to be a relict of the historic Marchfeld steppe.

Materials and Methods

In 2003, a long term conversion experiment from conventional to organic agriculture was set up in Rutzendorf in the Marchfeld (16°37' E, 48°13' N) to widen the scarce knowledge on organic farming in the pannonian region of Central and Eastern Europe (see SURBÖCK et al. 2006 for management and monitoring details). As part of this study, edaphic oribatid mites (Oribatida), predatory mites (Gamasida), and springtails (Collembola) were sampled once a year at the end of March to assess the effects of the conversion. The farm rather than the plot scale dynamics of the soil fauna was of interest for the project, so a composite sampling approach was implemented: 100 soil cores were collected from each land use type and the various manuring treatments of the experimental farm, extracted in a modified Berlese apparatus, pooled, and 10 aliquots each of the composite analyzed (BRUCKNER et al. 2000).

Results

One specimen of *Turcibates parvus* AYYILDIZ & LUXTON, 1989 was found in the hedgerows of the farm in March, 2005. Due to the composite sampling approach used, the precise location of the record is not known.

Discussion

Turcibates parvus has been found and described from a pasture soil near Erzurum, Eastern Anatolia, Turkey (AYYILDIZ & LUXTON 1989). Its morphological appearance is so distinct that comparison with the original description leaves no doubt as to the conspecificity of the specimens. Two other records are published from juniper woods in Spain (SUBÍAS & ARILLO 1998), so that the Austrian site is the fourth known locality of the species.

It is questionable if *T. parvus* is a valid name for the taxon at all. SUBÍAS (2009, and in litt. February, 2009) listed several potentially synonymic species which belong to three different genera. Remarkably, he did not provide arguments for these decisions, so that the status of the taxa remains questionable.

However, if we accept these synonymizations of SUBÍAS (2009), *T. parvus* has been recorded in nine localities from Western Europe to Middle Asia, including the current one (Tab. 1). Thus, I tentatively suggest a turano-ponto-mediterranean distribution for the taxon, with the Marchfeld at the northern margin of its range. This pattern is found in only few other organisms. As the distribution of animals, especially of invertebrates, is rarely adequately known, matching patterns are best searched for among vascular plants. But even here only few representatives of this type of distribution are known, for example the Dragonhead *Dracocephalum austriacum*, a rare steppe element with a highly disjunct distribution (MEUSEL et al. 1978)

There are several potential explanations for the occurrence of the mite in the Marchfeld samples.

Tab. 1: Records of the oribatid mite *"Turcibates parvus"*, including synonyms, and sorted from West to East.

Tab. 1: Funde der Hornmilbe „Turcibates parvus" und ihrer Synonymien, gereiht von West nach Ost.

Locality (current name and territory)	Name Variants	Reference
La Torre, Valencia province, Spain	*Hemileus (Turcibates) parvus*	SUBÍAS & ARILLO 1998
Bujaraloz, Zaragoza province, Spain	*Hemileus (Turcibates) parvus*	SUBÍAS & ARILLO 1998
Rutzendorf, Marchfeld, Austria	*Turcibates parvus*	this study
Odessa region, Ukraine	*Hemileus (?) ovalis*	KULIJEV 1968
Erzurum region, Turkey	*Turcibates parvus*	AYYILDIZ & LUXTON 1989
Volgogradskaya province, Russian Federation	*Dometorina rossica*	BASHKIROVA 1958
Jälilabad district, Lankaran-Astara region, Azerbaijan	*Hemileus* (?) *ovalis*	KULIJEV 1968
Mubarek, Qashqadario province, Uzbekistan	*Simkinia turanica*	KRIVOLUTSKY 1966
Bostandyk, Zhambyl province, Kazakhstan	*Simkinia turanica*	KRIVOLUTSKY 1966

First, *T. parvus* is a contaminant in our lab, as various non-soil mites and Diptera attracted by the light of the extractors are sometimes found in Berlese apparatuses. However, we have never processed samples from the Mediterranean, turanian, pontic, and pannonian regions outside Austria, so that this possibility can be ruled out.

Second, the species has been introduced with roots or soil adhering to plants. This may form an important anthropogenic pathway for alien oribatids. For example, HAMMER (1969) reported a large number of species in soil and all sorts of plant products checked for pests in U.S. quarantine stations. The mites originated from all over the world and, except for the very small and soft skinned forms, belonged to all families then designated. SKUBALA et al. (2001) found an "international" alien fauna in greenhouses in Poland. And indeed, approximately three kilometres of hedgerows have been newly established at the farm in 1984 and 1989. Bushes and trees were planted in dense multiple-row lines to reduce wind erosion (DEPARTMENT OF SOIL PROTECTION OF LOWER AUSTRIA 1982). Nevertheless, root balls can be excluded as a source of *T. parvus*: Due to the files of the Department of Soil Protection commissioned with the plantings, the hedgerow plants were grown from seeds and transplanted bare rooted. They did not originate from a tree nursery, where they may have become infested from mediterranean plants, but were grown on temporarily leased agricultural fields (Wasl, in litt. February, 2009). So, although appealing as an idea, introduction via infected hedgerow plants is highly unlikely.

Third, long range dispersal. A variety of passive long range dispersal modes of oribatid mites have been identified in literature, all of which may apply here. For example, KRIVOLUTSKY & LEBEDEVA (2001) recorded more than a hundred species of all major lineages from bird plumage. In analogy to *T. parvus*, they reported findings of mediterranean species in the European part of Russia, and of boreal species in swan feathers in South Russia. Several authors provided evidence for passive wind dispersal, for example GLICK (1939) by trapping specimens from the air with airplanes 150 m above ground. Unfortunately, data on the significance of long range travelers for the composition of local oribatid assemblages are not available. It appears anyway highly improbable that we collected one of them just by chance or a member of a presumably short lived descendant population.

Fourth, *T. parvus* is native to the Marchfeld. It is not surprising that an established population has not been detected so far, as there is no current study of the oribatid mites of the region (and only a handful of the Austrian Pannonian region in general). And being counterintuitive at first view, the Austrian site matches the localities of the other records quite well. The habitat conditions there are not known, but all specimens have been sampled from semiarid to semi desert climates with low precipitation (200-600 mm) and predominant steppe vegetation (KOTLYAKOV et al. 1998). This meets the conditions in the historic Marchfeld steppe with its summer dry pastures and areas of drifting sand. Thus, considering *T. parvus* a steppe or sand dune

relict is the most plausible explanation for its occurrence at the experimental farm.

We may speculate that *T. parvus* is generally a rare species with a disjunct biogeographic distribution, very much like in *Dracocephalum austriacum*. This would explain the low number of records, even though several countries in the conjectured range of *T. parvus* are among the best explored in the world, especially that of Hungary (Mahunka & Mahunka-Papp 2000) and of Italy (Bernini et al. 1995).

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