

Oribatid mites (Acari: Oribatida) in the LTSER-research area in Mazia/Matsch (South Tyrol, Prov. Bolzano, Italy) – Investigations in the frame of the research week 2016

Abstract

Oribatid mites were investigated in the frame of the "Long-Term Socio-economic and Ecosystem Research" in the Matsch Valley/Val di Mazia (municipality of Mals/Malles Venosta), Vinschgau Valley, South Tyrol. Soil and litter samples were taken from characteristic microhabitats in the following sites: dry grasslands and pastures at 1000, 1500, 2000 m a.s.l., fertilized meadows (1500 m a.s.l.), larch forest pastures (1500 m a.s.l.) and montane pine forest (about 2000 m a.s.l.), 3 replicate sites each. A total of 119 oribatid species belonging to 41 families were encountered. The species *Gymnodamaeus meyeri* BAYARTOGTOKH & SCHATZ, 2009 is a new record for Italy, *Eobrachychthonius latior* (BERLESE, 1910) *Feiderzetes latus* (SCHWEIZER, 1956), *Licnodamaeus costula* GRANDJEAN, 1931, *Paratritia baloghi* MORITZ, 1966, *Pergalumna dorsalis* (C.L. KOCH, 1841), *Phauloppia rauschenensis* (SELLNICK, 1908) are new records for South Tyrol. The majority of the species have a wide general distribution – palaeartic, holarctic, or semi/cosmopolitan, others show a restricted distribution to Central Europe and the Alps. A remarkable number of species can be classified as „southern species“ (distribution center in southern Europe or in the southern Palaearctic region). The proportion of these species is highest in the lower dry grassland (at 1000 m a.s.l.) and decreases with altitude. The species assemblages in the different sites is dominated by xerophilous species in the dry grasslands and silvicolous species in the larch pastures and mountain pine forests. Similarity coefficients (Sørensen index) are highest between the forested sites: larch forest pastures and montane pine forest, both with the highest species numbers (70 spp. each), and among the dry grasslands. Some remarkable species are presented, and their general distribution and habitat requirements are discussed in detail.

Keywords: Acari, Oribatida, faunistics, Alps, species assemblages, South Tyrol, Italy

Introduction

Oribatida (Acari) are a species-rich taxon of free-living arthropods. Presently more than 11.000 described species are known worldwide, around 400 species in South Tyrol (Schatz in prep.). Oribatid mites are important agents in the decomposition of organic plant matter, soil formation, distribution of fungi and in the nutrient cycle. Many species have specific habitat requirements. Some are adapted to dry habitats as dry grasslands, lichens on rocks and on bark of trees and bushes. A small number of oribatid mite species are linked to bogs and fresh water habitats. Most inhabit the litter layer, dead wood and humus. Moist forest litter and moss are particularly rich in species, which occur in high abundances (SCHATZ & SCHUSTER 2009).

Author's address:

Dr. Heinrich Schatz
c/o Institute of Zoology
University of Innsbruck
Technikerstr. 25
A-6020 Innsbruck, Austria
heinrich.schatz@uibk.ac.at

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Measurements concerning influence of climatic change on micro-climate, plant diversity and hay yield of grassland in mountainous regions, as well as vegetation and landscape mappings at different altitudes of the Matsch Valley are in progress since 2008. Since 2014 this research is undertaken in the frame of LTER Italy. The "Long-Term Ecosystem Research Network" constitutes a worldwide network of investigation areas for longterm ecosystem monitoring in different biomes in order to advance understanding of global change. The human impact is incorporated in the "LTSE" project (Long Term Socio-Ecological Research). A survey of the biodiversity of selected groups of organisms was undertaken during the "Science Week Matscher Tal 2016".

The present study on oribatid mites in the Matscher Tal aimed at a faunistic overview of the area and the different vegetation types and constitute an interesting addition to faunistic and taxonomic investigations on oribatid mites in South Tyrol. The Matscher Tal is situated in the dry grassland complex of the upper Vinschgau. Only few investigations on oribatid mites were carried out in this region, especially around the Reschenpass (FISCHER & SCHATZ 2009) and in the Münstertal (SCHATZ & FISCHER 2012). SCHWEIZER (1956) reported and described numerous oribatid species from the nearby Swiss National Park in Grison. Studies on oribatid mites were also performed in dry grassland complexes in the adjoining North Tyrol (SCHATZ & FISCHER 2015).

Investigation area and methods

The Matscher Tal is a side valley of the Upper Vinschgau and extends from the municipality of Mals in the main valley towards northeast up to the glacier Matscher Ferner and the Weißkugel at the Austrian-Italian border. The lower, outer part of the valley is dominated by dry meadows and pastures, while hay meadows, larch and pine forests, and alpine pastures characterize the landscape at higher altitudes. The Vinschgau is surrounded by the high peaks and ridges of the Central Eastern Alps enclosing the valley into an almost insular location with one of the driest climate of the Alps. A detailed outline of the investigation area and the studied sites are presented in RIEF et al. (2017).

The sampling of oribatid mites focused rather on the acquisition of faunistic data than on abundance. Following sites and microhabitats were collected, mainly during the research week in June 2016 (a total of 58 soil and litter samples). An additional sampling in April 2017 in the fertilized meadows MW1500 (1500 m a.s.l., 15 cylindrical samples with soil corer, ø 10 cm, depth 8 cm, leg. J. Seeber, M. Steinwandter) completed the sampling program.

- WE1000_1 dry meadow and pasture (1080-1090 m a.s.l.) (27.06.2016, 4 samples): herb and grass cushions, litter under *Juniperus*.
- WE1000_2 dry meadow and pasture (1100 m) (27.06.2016, 4 samples): herb and grass cushions, rocky steppe.
- WE1000_3 dry meadow and pasture (1100 m) (27.06.2016, 4 samples): herb and grass cushions, leaf litter under *Hippophae rhamnoides*.
- WE1500_1 dry meadow (1540 m) (29.06.2016, 5 samples): herb and grass cushions, rocky steppe, needle litter under *Pinus sylvestris*.
- WE1500_2 dry meadow (1550 m) (29.06.2016, 4 samples): herb and grass cushions, rocky steppe, litter under *Juniperus*.
- WE1500_3 dry meadow (1580 m) (29.06.2016, 4 samples): herb and grass cushions, rocky steppe.
- WE2000_1 dry meadow (1950-1965 m) (28.06.2016, 4 samples): herb and grass cushions, rocky steppe.
- WE2000_2 dry meadow (1915 m) (28.06.2016, 3 samples): herb and grass cushions.

- WE2000_3 dry meadow (1935 m) (28.06.2016, 3 samples): herb and grass cushions.
- MW1500_1 fertilized meadow (1437 m) (27.04.2017, 5 samples): grass, roots and soil.
- MW1500_2 fertilized meadow (1450 m) (27.04.2017, 5 samples): grass, roots and soil.
- MW1500_3 fertilized meadow (1466 m) (27.04.2017, 5 samples): grass, roots and soil.
- LW1500_1 larch forest (*Larix decidua*) (1670 m) (28.06.2016, 4 samples): litter under larch, grass litter, moss cushion from larch butt.
- LW1500_2 larch forest (*Larix decidua*) (1590-1600 m) (27.06.2016, 4 samples): litter under larch, grass litter, lichens from larch stem.
- LW1500_3 larch forest (*Larix decidua*) (1540-1550 m) (27.06.2016, 4 samples): litter under larch, grass litter.
- ZW2000_1 Swiss pine forest (*Pinus cembra*) (2090 m) (28.06.2016, 3 samples): pine needles, grass litter, leaf litter under *Rhododendron*.
- ZW2000_2 Swiss pine forest (*Pinus cembra*) (2080 m) (28.06.2016, 4 samples): pine needles, grass litter, litter and moss under *Juniperus*.
- ZW2000_3 Swiss pine forest (*Pinus cembra*) (2010-2020 m) (28.06.2016, 4 samples): pine needles, grass litter, leaf litter under *Rhododendron* and *Vaccinium*.

The extraction of the material was carried out using a Macfadyen extractor in the Institute of Ecology, University of Innsbruck. The determination of the oribatid mites mainly followed the key of WEIGMANN (2006), for some taxa specific literature was used (z.B. PÉREZ-ÍÑIGO 1993, 1997, SUBÍAS & ARILLO 2001, and others).

Results and Discussion

A total of 119 species belonging to 41 families were encountered (table 1). Families richest in species are Ceratozetidae, Scheloribatidae (9 spp. each), Damaeidae, Galumnidae, Oppiidae, Oribatulidae (7 spp. each), Phenopelopidae (6 spp.). Thus, half of all species belong to one of these seven families. Most frequent species are *Tectocepheus sarekensis* (347 specimens in 39 samples, 6 sites), *Scheloribates laevigatus* (271/30/6), *Scheloribates (Topobates) holsaticus* (234/11/1, all in the fertilized meadows), *Chamobates voigtsi* (147/19/3), *Oribatula tibialis* (146/27/5), *Eupelops torulosus* (130/23/4), *Scutovertex sculptus* (109/21/3, all in the dry meadows), *Peloptulus phaenotus* (106/24/4), *Hemileius initialis* (103/20/4), *Passalozetes intermedius* (98/20/3, all in the dry meadows). On the other hand 35 species were found as single records only (with 1, 2 or 3 specimens) which suggests the presence of further unrecorded species. During the biodiversity day 2016, which was also performed in the Matscher Tal but in other investigation sites, a total of 137 species were encountered (SCHATZ 2017).

Table 1: Oribatid mites (Acari, Oribatida) collected during the investigation of LTSEr („Research week 2016“) in the Matscher Tal: List of species in each site, family affiliation, number of specimens (total), general distribution and habitat requirement.

Abbreviations: N number of specimens. Sites WE1000, WE1500, WE2000 dry meadow 1000 m SH, 1500 m, 2000 m, MW1500 fertilized meadows LW1500 larch forest (*Larix decidua*) 1500 m, ZW Swiss pine forest (*Pinus cembra*) 2000 m; 3 replicates summarized. General distribution cos semi/cosmopolitan, eur Europe, hol holarctic, c-eur Central Europe, c-n-eur Central-, North Europe, c-s-eur Central-, South Europe, pal palaeartic, (south) „southern species“ – species with distribution centre in South and Southeast Europe. Habitat requirement ar arboricolous, eu euryoecious, hy hygrophilous, li lichenicolous, mu muscicolous, pr praticolous, si silvicolous, xe xerophilous.

SPECIES	N	WE 1000	WE 1500	WE 2000	MW 1500	LW 1500	ZW 2000	GENERAL DISTRI- BUTION	HABITAT REQUIRE- MENT
<i>number of samples</i>		12	13	10	15	12	11		
<i>number of species</i>		44	29	37	13	70	70		
Fam. Achipteridae									
<i>Achipteria coleoprata</i> (LINNAEUS, 1758)	45			x	x	x	x	hol	eu
<i>Anachipteria shtanchaevae</i> SUBIAS, 2009	13			x				c-s-eur (south)	li mu xe alpine
<i>Parachipteria punctata</i> (NICOLET, 1855)	13		x			x	x	hol	eu
Fam. Brachychthoniidae									
<i>Eobrachychthonius lator</i> (BERLESE, 1910)	3	x					x	hol	si
<i>Liochthonius lapponicus</i> (TRÄGÄRDH, 1910)	2		x	x				hol	hy si
<i>Sellnickochthonius immaculatus</i> (FORSSLUND, 1942)	38				x			hol - cos	eu
Fam. Caleremaeidae									
<i>Caleremaeus monilipes</i> (MICHAEL, 1882)	22				x	x	x	eur	ar si
Fam. Carabodidae									
<i>Carabodes areolatus</i> BERLESE, 1916	4					x	x	pal	ar hy mu
<i>Carabodes labyrinthicus</i> (MICHAEL, 1879)	90		x			x	x	hol	eu
<i>Carabodes ornatus</i> STORKÁN, 1925	3			x		x		pal	si hy
Fam. Ceratozetidae									
<i>Ceratozetes gracilis</i> (MICHAEL, 1884)	3		x			x		hol - cos	eu
<i>Ceratozetes thienemanni</i> WILLMANN, 1943	1						x	hol - cos	si
<i>Diapterobates humeralis</i> (HERMANN, 1804)	10	x	x	x		x	x	hol	ar si
<i>Fuscozetes setosus</i> (C.L. KOCH, 1839)	12						x	hol	si
<i>Jugatala angulata</i> (C.L. KOCH, 1840)	13			x		x	x	c-eur	ar alpine
<i>Lepidozetes singularis</i> BERLESE, 1910	54					x	x	hol	ar li mu xe alpine
<i>Trichoribates berlesei</i> JACOT, 1929	3		x			x	x	hol	eu
<i>Trichoribates incisellus</i> (KRAMER, 1897)	17	x	x	x				hol	eu
<i>Trichoribates novus</i> (SELLNICK, 1929)	22	x		x	x		x	hol	hy
Fam. Chamobatidae									
<i>Chamobates birulai</i> (KULCZYNSKI, 1902)	62					x	x	pal	si
<i>Chamobates voigtsi</i> (OUDEMANS, 1902)	147			x		x	x	pal	ar si mu
Fam. Compactozetidae									
<i>Cepheus latus</i> (C.L. KOCH, 1835)	23					x	x	hol	ar mu si
<i>Tritegeus bisulcatus</i> GRANDJEAN, 1953	2					x	x	eur	si
Fam. Crotoniidae									
<i>Camisia biurus</i> (C.L. KOCH, 1839)	5					x	x	hol	ar mu xe
<i>Camisia horrida</i> (HERMANN, 1804)	7			x		x	x	hol	ar mu xe
<i>Camisia segnis</i> (HERMANN, 1804)	3	x					x	hol - cos	ar mu xe

SPECIES	N	WE 1000	WE 1500	WE 2000	MW 1500	LW 1500	ZW 2000	GENERAL DISTRI- BUTION	HABITAT REQUIRE- MENT
<i>Camisia spinifer</i> (C.L. KOCH, 1836)	3	x					x	hol - cos	ar si xe
<i>Platynothrus peltifer</i> (C.L. KOCH, 1839)	56			x			x	hol - cos	eu
Fam. Ctenobelbidae									
<i>Ctenobelba pectinigera</i> (BERLESE, 1908)	2	x				x		c-s-eur, pal (south)	si xe
Fam. Cymbaeremaeidae									
<i>Cymbaeremaeus cymba</i> (NICOLET, 1855)	16				x	x	x	pal	eu
Fam. Damaeidae									
<i>Belba compta</i> (KULCZYNSKI, 1902)	18						x	pal	hy mu si
<i>Belba</i> sp.	1	x							
<i>Damaeus gracilipes</i> (KULCZYNSKI, 1902)	5					x	x	pal	si
<i>Damaeus riparius</i> NICOLET, 1855	6					x	x	pal	mu si
<i>Kunstdamaeus tecticola</i> (MICHAEL, 1888)	11	x	x			x		eur	li mu xe
<i>Metabelba papillipes</i> (NICOLET, 1855)	33					x	x	hol - cos	mu si
<i>Porobelba spinosa</i> (SELLNICK, 1920)	32	x				x		pal	li mu si xe
Fam. Eniochthoniidae									
<i>Eniochthonius minutissimus</i> (BERLESE, 1904)	8		x			x	x	hol - cos	eu
Fam. Eremaeidae									
<i>Eremaeus hepaticus</i> (C.L. KOCH, 1835)	8			x		x		hol	si xe
<i>Eueremaeus oblongus</i> (C.L. KOCH, 1836)	38		x	x		x	x	hol	mu si xe ar
<i>Eueremaeus silvestris</i> (FORSSLUND, 1956)	18					x		hol	eu
<i>Eueremaeus valkanovi</i> (KUNST, 1957)	50	x	x			x	x	c-s-eur, pal (south)	ar mu xe
Fam. Galumnidae									
<i>Acrogalumna longipluma</i> (BERLESE, 1904)	21	x				x	x	hol - cos	si
<i>Galumna lanceata</i> (OUDEMANS, 1900)	5	x				x		pal	eu
<i>Galumna tarsipennata</i> OUDEMANS, 1913	2	x						pal (south)	xe
<i>Pergalumna dorsalis</i> (C.L. KOCH, 1841)	8	x						pal	si
<i>Pergalumna formicaria</i> (BERLESE, 1914)	38	x	x			x		hol	mu
<i>Pergalumna nervosa</i> (BERLESE, 1914)	16			x		x	x	hol - cos	eu
<i>Pilogalumna crassiclava</i> (BERLESE, 1914)	14	x				x		pal (south)	si xe
Fam. Gymnodamaeidae									
<i>Gymnodamaeus meyeri</i> BAYARTOGTOKH & SCHATZ, 2009	15					x		c-eur	xe
Fam. Haplozetidae									
<i>Haplozetes vindobonensis</i> (WILLMANN, 1935)	5	x						pal (south)	xe
<i>Protoribates capucinus</i> BERLESE, 1908	1		x					hol - cos	si xe
Fam. Hermannidae									
<i>Hermannia gibba</i> (C.L. KOCH, 1840)	15			x			x	hol	si hy
Fam. Hypochthoniidae									
<i>Hypochthonius rufulus</i> C.L. KOCH, 1835	1				x			hol - cos	eu
Fam. Liacaridae									
<i>Adoristes ovatus</i> (C.L. KOCH, 1839)	62		x			x	x	hol	si
<i>Liacarus coracinus</i> (C.L. KOCH, 1840)	40						x	hol	eu

SPECIES	N	WE 1000	WE 1500	WE 2000	MW 1500	LW 1500	ZW 2000	GENERAL DISTRIBU- TION	HABITAT REQUIRE- MENT
<i>Xenillus tegeocranus</i> (HERMANN, 1804)	16					x	x	pal (south)	eu
Fam. Licneremaeidae									
<i>Licneremaeus licnophorus</i> (MICHAEL, 1882)	8	x				x		hol (south)	ar mu si xe
Fam. Licnodamaeidae									
<i>Licnodamaeus costula</i> GRANDJEAN, 1931	1	x						c-s-eur (south)	xe
<i>Licnodamaeus undulatus</i> (PAOLI, 1908)	16	x						c-s-eur, pal (south)	ar xe
Fam. Micreremidae									
<i>Micreremus brevipes</i> (MICHAEL, 1888)	9	x				x	x	pal	ar li mu xe
Fam. Mycobatidae									
<i>Feiderzetes latus</i> (SCHWEIZER, 1956)	2					x		s-eur (south)	si xe alpine
<i>Mycobates parmelliae</i> (MICHAEL, 1884)	3					x		hol	ar li mu alpine
<i>Punctoribates punctum</i> (C.L. KOCH, 1839)	1				x			hol - cos	eu
Fam. Niphocephidae									
<i>Niphocephus nivalis</i> (SCHWEIZER, 1922)	1						x	pal	alpine
Fam. Oppiidae									
<i>Berniniella bicarinata</i> (PAOLI, 1908)	6					x	x	pal - cos	eu
<i>Dissorhina ornata</i> (OUDEMANS, 1900)	4			x			x	hol	eu
<i>Oppiella falcata</i> (PAOLI, 1908) (<i>Oppiella</i>)	2						x	pal	si
<i>Oppiella keilbachi</i> (MORITZ, 1969) (<i>Moritzoppia</i>)	42	x		x		x	x	pal	si
<i>Oppiella nova</i> (OUDEMANS, 1902) (<i>Oppiella</i>)	6					x		hol - cos	eu
<i>Oppiella subpectinata</i> (OUDEMANS, 1900) (<i>Rhinoppia</i>)	14					x	x	hol - cos	eu
<i>Oppiella uliginosa</i> (WILLMANN, 1919) (<i>Oppiella</i>)	4		x	x	x		x	c-eur	ar mu si
Fam. Oribatellidae									
<i>Oribatella longispina</i> BERLESE, 1915	23			x		x	x	c-s-eur (south)	mu si alpine
<i>Oribatella quadricornuta</i> (MICHAEL, 1880)	4					x		hol	ar si xe
Fam. Oribatulidae									
<i>Oribatula amblyptera</i> BERLESE, 1916	4	x	x	x				c-s-eur (south)	xe
<i>Oribatula interrupta</i> (WILLMANN, 1939)	30		x	x		x		pal	li mu alpine
<i>Oribatula longelamellata</i> SCHWEIZER, 1956	18		x	x				c-s-eur (south)	alpine
<i>Oribatula tibialis</i> (NICOLET, 1855)	146	x	x	x		x	x	hol - cos	eu
<i>Phauloppia lucorum</i> (C.L. KOCH, 1840)	18	x		x		x	x	hol	ar li xe
<i>Phauloppia rauschenensis</i> (SELLNICK, 1908)	1	x						pal	ar si
<i>Zygoribatula frisiae</i> (OUDEMANS, 1900)	15	x						hol	ar li mu si xe
Fam. Oribotritiidae									
<i>Paratritia baloghi</i> MORITZ, 1966	1						x	pal	si
Fam. Parakalummidae									
<i>Neoribates aurantiacus</i> (OUDEMANS, 1914)	69				x	x	x	hol	hy si
Fam. Passalozetidae									
<i>Passalozetes africanus</i> GRANDJEAN, 1932	20	x	x	x				hol (south)	xe
<i>Passalozetes intermedius</i> MIHELČIČ, 1954	98	x	x	x				pal (south)	xe

SPECIES	N	WE 1000	WE 1500	WE 2000	MW 1500	LW 1500	ZW 2000	GENERAL DISTRI- BUTION	HABITAT REQUIRE- MENT
<i>Passalozetes perforatus</i> (BERLESE, 1910)	13	x						pal	xe
Fam. Peloppiidae									
<i>Ceratoppia bipilis</i> (HERMANN, 1804)	36	x					x	hol	eu
Fam. Phenopelopidae									
<i>Eupelops acromios</i> (HERMANN, 1804)	4					x	x	pal - cos	ar si xe
<i>Eupelops plicatus</i> (C.L. KOCH, 1835)	8					x	x	hol	eu
<i>Eupelops subuliger</i> (BERLESE, 1916)	67						x	c-s-eur (south)	si
<i>Eupelops tardus</i> (C.L. KOCH, 1835)	88	x		x		x		pal	si xe
<i>Eupelops torulosus</i> (C.L. KOCH, 1835)	130		x		x	x	x	pal	si hy
<i>Peloptulus phaenotus</i> (C.L. KOCH, 1844)	106	x	x	x			x	pal	eu
Fam. Phthiracaridae									
<i>Phthiracarus laevigatus</i> (C.L. KOCH, 1841)	16					x	x	pal - cos	si mu xe
<i>Phthiracarus longulus</i> (C.L. KOCH, 1841)	23			x		x	x	hol	si
Fam. Quadroppiidae									
<i>Quadroppia hammerae</i> MINGUEZ, RUIZ & SUBÍAS, 1985	1						x	pal - cos	si
<i>Quadroppia quadricarinata</i> (MICHAEL, 1885)	2					x	x	hol - cos	eu
Fam. Scheloribatidae									
<i>Dometorina plantivaga</i> (BERLESE, 1895)	6	x		x				hol - cos	ar xe
<i>Hemileius initialis</i> (BERLESE, 1908)	103	x	x			x	x	pal - cos	eu
<i>Liebstadia humerata</i> SELLNICK, 1929	4					x	x	hol	ar mu xe
<i>Liebstadia pannonica</i> (WILLMANN, 1951)	1	x						hol (south)	xe
<i>Liebstadia similis</i> (MICHAEL, 1888)	20	x		x		x	x	hol - cos	eu
<i>Liebstadia willmanni</i> MIKO & WEIGMANN, 1996	2	x		x				c-eur	hy si
<i>Scheloribates holsaticus</i> (WEIGMANN, 1969) (<i>Topobates</i>)	234				x			c-sw-eur	hy
<i>Scheloribates laevigatus</i> (C.L. KOCH, 1835)	271	x	x	x	x	x	x	hol - cos	hy
<i>Scheloribates pallidulus</i> (C.L. KOCH, 1841)	12					x	x	hol - cos	eu
Fam. Scutoverticidae									
<i>Provertex kuehneli</i> MIHELČIĆ, 1959	3		x	x				c-n-eur	li mu xe
<i>Scutovertex minutus</i> (C.L. KOCH, 1835)	8						x	pal - cos	mu xe
<i>Scutovertex sculptus</i> MICHAEL, 1879	109	x	x	x				c-s-eur, pal (south)	ar mu xe
Fam. Suctobelbidae									
<i>Suctobelba altvateri</i> MORITZ, 1970	3					x	x	c-s-eur, pal (south)	hy mu si
<i>Suctobelbata prelli</i> (MÄRKEL & MEYER, 1958)	1					x		c-s-eur (south)	si
<i>Suctobelbella sarekensis</i> (FORSSLUND, 1941)	14					x	x	hol	eu
<i>Suctobelbella subcornigera</i> (FORSSLUND, 1941)	3					x	x	pal - cos	eu
<i>Suctobelbella subtrigona</i> (OUDEMANS, 1900)	1					x		hol - cos	eu
Fam. Tectocephidae									
<i>Tectocephus sarekensis</i> (TRÄGARDH, 1910)	347	x	x	x	x	x	x	hol - cos	eu
<i>Tectocephus tenuis</i> KNÜLLE, 1954	2			x				pal	xe
Fam. Thyrisomidae									
<i>Pantelozetes paolii</i> (OUDEMANS, 1913)	2					x	x	hol (south)	eu

SPECIES	N	WE 1000	WE 1500	WE 2000	MW 1500	LW 1500	ZW 2000	GENERAL DISTRI- BUTION	HABITAT REQUIRE- MENT
Fam. Trhypochthoniidae									
<i>Trhypochthonius tectorum</i> (BERLESE, 1896)	5	x						hol - cos	mu xe alpine
Fam. Zetorchestidae									
<i>Microzetorchestes emeryi</i> (COGGI, 1898)	2	x	x					pal (south)	mu xe
Juvenile instars:									
Achipteriidae juv.	17	x		x		x	x		
Ceratozetidae juv.	23	x			x	x	x		
Eremaeidae juv.	17	x	x			x			
Galumnidae juv.	1	x							
Phenopelopidae juv.	101	x			x	x	x		
Scheloribatidae juv.	96	x	x	x	x	x	x		
Tectocephidae juv.	155	x		x	x				
Oribatida juv. indet.	11	x	x			x	x		
total number of specimens	3815	757	353	196	930	949	630		

Tab. 2: Oribatid mites (Acari, Oribatida) collected during the investigation of LTSEr („Research week 2016“) in the Matscher Tal: species similarity with adjacent regions

REGION	SPECIES TOTAL	SPECIES COMMON WITH PRESENT STUDY IN THE MATSCHER TAL
Prov. Bolzano*	415	115
Prov. Trento*	291**	81
Prov. Sondrio*	121**	36
Grisson*	226	74
Switzerland total*	431	92
North Tyrol (KRISPER et al. 2017)	425	113
Austria total (KRISPER et al. 2017)	606	116
Biodiversity day Reschenpass 2008 (FISCHER & SCHATZ 2009)	128	74
Biodiversity day Münstertal 2011 (SCHATZ & FISCHER 2012)	91***	56
Biodiversity day Matscher Tal 2016 (SCHATZ 2017)	137	88

* source: Schatz (unpubl. data)

** including unpublished records (F. Bernini, pers. comm.)

*** South Tyrolean part

Gymnodamaeus meyeri represents a new record for Italy, further six species are new records for South Tyrol: *Licnodamaeus costula*, *Paratritia baloghi*, *Pergalumna dorsalis*, *Phauloppia rauschenensis*, also *Eobrachychthonius latior* and *Feiderzetes latus* (the latter two species were found simultaneously at the biodiversity day in the Matscher Tal, SCHATZ 2017).

Most species have a wide general distribution; Central and South Europe (9 spp.), Europe (4 spp.), palaearctic (34 spp.), holarctic (36 spp.) and larger („semi/cosmopolitan“, 31 spp.). Four species are only known from the Alps, resp. from Central Europe (*Gymnodamaeus meyeri*, *Jugatala angulata*, *Liebstadia willmanni*, *Oppiella uliginosa*). One specimen of the genus *Belba* could not be allocated to a known species.

The relatively high percentage of species with a distribution centre in South Europe or in the southern palaearctic region („mediterranean“ or „southern“ species, SCHUSTER 1959, 1960, TARMAN 1977, HÖPPERGER & SCHATZ 2013) in all sites is remarkable (in total 23 spp. or almost 20%, table 3). The proportion of these „southern“ species is highest in the dry meadow WE1000 (33%) and decreases with higher altitudes (table 3b). This demonstrates the importance of the „arid island“ Vinschgau and its side valleys in the center of the Alps as dispersal route for southern European species northwards, up to the dry grasslands and forests of the Inn valley in North Tyrol (MIHELČIČ 1962, SCHATZ & FISCHER 2015).

Habitat relationships and requirements

Habitat relationships and special requirements are known for many oribatid mite species (summarized in SCHATZ 1983, PÉREZ-ÍÑIGO 1993, 1997, SUBÍAS & ARILLO 2001, WEIGMANN 2006, supplemented and updated). Most species show preference for more than one type of habitat. Hence, they may appear in several different categories in the following analysis (tables 1, 3). Within the total species range silvicolous (47 spp.) and xerophilous (41 spp.) species are dominant, beside numerous euryoecious ubiquists (34 spp.), also arboricolous (26 spp.) and muscicolous species (31 spp.) are well represented.

Habitat requirements in the particular sites are listed as percentages in tables 3b and 3c. Euryoecious species are dominant with different proportions in each site. Xerophilous species dominate in the dry meadows of all three altitudinal levels, in WE2000 together with silvicolous species. Especially in the sun-exposed dry meadows WE1000 xerophilous species contribute almost 60%. The relatively high proportion of hygrophilous species in the dry meadow WE2000 (16%) compared with other sites (7-10%) is noticeable. This site is situated in close vicinity to the montane forest. The snow coverage at this altitude lasts relatively long, which might explain the large amount of silvicolous and hygrophilous species in this site. As expected, silvicolous species dominate the forest sites larch forest LW1500 and Swiss pine forests ZW2000. A special situation is apparent in the fertilized meadows MW1500. Only 13 species were collected, dominated by *Scheloribates* (*Topobates*) *holsaticus*, *Tectocephus sarekensis*, *Eupelops torulosus*, which contribute together more than 80% of the total individual number of this site. Also almost 50% of the species in the fertilized meadows are known to be hygrophilous.

Table 3: Oribatid mites (Acari, Oribatida) collected during the investigation of LTSE ("Research week 2016") in the Matscher Tal: Habitat requirements of species and proportion of "southern species" (data from the literature, see text). Remarks: hygrophilous – including mesohygrophilous and tyrphobiontic; xerophilous / xerobiontic – for the definition see HÖPPERGER & SCHATZ 2013); mediterranean – "southern species" see text.

Table 3a: Habitat requirements – number of species

HABITAT REQUIREMENT	ALL SITES	WE1000	WE1500	WE2000	MW1500	LW1500	ZW2000
spp. total	118*	43*	29	37	13	70	70
silvicolous	47	14	7	13	4	30	31
xerophilous	41	25	10	13	0	20	13
euryoecious	34	8	10	9	5	25	25
hygrophilous	11	3	2	6	6	5	7
alpine	10	1	2	5	0	6	4
mediterranean	23	14	7	7	0	10	6
microhabitats:							
arboricolous	26	12	5	9	2	18	18
lichenicolous	10	5	3	4	0	7	3
muscolous	31	11	9	9	1	21	19

* without *Belba* sp.

Table 3b: Habitat requirements – percentage of species with a specific habitat requirement calculated from the respective habitat requirement in each particular site (site = 100%)

HABITAT REQUIREMENT	ALL SITES	WE1000	WE1500	WE2000	MW1500	LW1500	ZW2000
Spp. total	118 (100%)	43 (100%)	29 (100%)	37 (100%)	13 (100%)	70 (100%)	70 (100%)
silvicolous	39,8	32,6	24,1	35,1	30,48	42,9	44,3
xerophilous	34,7	58,1	34,5	35,1	0	28,6	18,6
euryoecious	28,8	18,6	34,5	24,3	38,5	35,7	35,7
hygrophilous	9,3	7,0	6,9	16,2	46,2	7,1	10,0
alpine	8,5	2,3	6,9	13,5	0	8,6	5,7
mediterranean	19,5	32,6	24,1	18,9	0	14,2	8,6

Table 3c: Habitat requirements – percentage of species with a specific habitat requirement calculated from the total number of the respective habitat requirement (habitat requirement = 100%)

HABITAT REQUIREMENT	ALL SITES	WE1000	WE1500	WE2000	MW1500	LW1500	ZW2000
Spp total	114	43	29	37	13	70	70
silvicolous	47 (100%)	29,8	14,9	27,7	8,5	63,8	66,0
xerophilous	41 (100%)	61,0	24,4	31,7	0	48,8	31,7
euryoecious	34 (100%)	23,5	29,4	26,5	14,7	73,5	73,5
hygrophilous	11 (100%)	27,3	18,2	54,5	54,5	45,5	63,6
alpine	10 (100%)	10,0	20,0	50,0	0	60,0	40,0
mediterranean	23 (100%)	61,0	30,0	30,0	0	43,5	26,1

Comparison of the sites

The investigated sites in the Matscher Tal host different oribatid species communities. The species similarity was calculated using the Sørensen-Index (MÜHLENBERG 1993, SOUTHWOOD & HENDERSON 2000). This allows a simple comparison of species assemblages from non-uniform samples, without quantitative aspects (as abundance or dominance). Faunistic relationships become obvious above 40% species similarity.

Table 4: Oribatid mites (Acari, Oribatida) collected during the investigation of LTSEr ("Research week 2016") in the Matscher Tal: Species similarity between the sites.

Similarity coefficient (Sørensen index, $[2c * 100 / (a + b)]$, a (b) = species number in habitat A, B, c = number of species common in A and B]. Species in common upper left, Sørensen index bottom right, values >40% similarity highlighted.

	ZW2000	LW1500	MW1500	WE2000	WE1500	WE1000	SPECIES NUMBER
WE1000	17	19	3	17	15	-	44
WE1500	15	17	4	16	-	34,1%	29
WE2000	21	19	5	-	48,5%	42,0%	37
MW1500	9	7	-	20,0%	19,0%	10,5%	13
LW1500	50	-	16,9%	35,5%	34,3%	33,3%	70
ZW2000	-	71,4%	21,7%	39,2%	30,3%	1,8%	70

The fertilized meadows MW1500 are very poor in species, and therefore they exhibit also a low species similarity with all other sites. The highest species numbers were found in both forest sites (larch forest LW1500, Swiss pine forests ZW2000: 70 spp. each). Among the dry meadows the lowest site W1000 is the most diverse (44 spp.), followed by W2000 (37 spp.) and W1500 (29 spp.).

High species similarities exist between the forest sites LW1500 and ZW2000 (50 spp., >70%), also between the dry meadows WE2000 with WE1500 (16 spp., 48,5%) and WE1000 (17 spp., 42,0%). Similarities between the other sites vary between 30 and 40%, and the lowest value appears between the dry meadow WE1000 and Swiss pine forest ZW2000 (17 spp., <30%), which are the most distant.

Two species (*Scheloribates laevigatus*, *Tectocepheus sarekensis*) occur in all 6 sites, two species (*Diapterobates humeralis*, *Oribatula tibialis*) in 5 sites, additional eleven species in 4 sites, A total of 36 species was found in one site only (WE1000 11 spp., WE1500 1 sp., WE2000 2 spp., MW1500 6 spp., LW1500 8 spp., ZW2000 10 spp.).

Some remarkable species records

Belba sp. (Fam. Damaeidae): The single specimen could not be allocated to a known species; further investigations are ongoing. In the Matscher Tal in the dry meadow WE1000.

Dometorina plantivaga (BERLESE, 1895) (Fam. Scheloribatidae): General distribution: records in all continents except Australia and Antarctica, primarily in arid habitats, also in litter of forest soils, frequently corticolous. All developmental stages of this species live and mine in lichens (GRANDJEAN 1951), hence the species is rarely found in extracted material. In South Tyrol previous records in Natz-Schabs (SCHATZ 2005), Ahrntal (SCHATZ & FISCHER 2010), Castelfeder hill near Auer (HÖPPERGER & SCHATZ 2013). In the Matscher Tal single records in the dry meadows WE1000_3 and WE2000_1.

Eobrachychthonius latior BERLESE, 1910 (Fam. Brachychthoniidae): General distribution: in the Southern Alps (Prov. Belluno), holarctic, rare; preferably in forest soils and bogs. New record for South Tyrol (also at the biodiversity day 2016, SCHATZ 2017). In the Matscher Tal single records in the dry meadow WE1000_2 and in the Swiss pine forest ZW2000_2.

Feiderzetes latus (SCHWEIZER, 1956) (Fam. Mycobatidae): General distribution: in the Southern Alps (Prov. Belluno, Sondrio (F. Bernini pers. comm.), Grisons, Ticino), Southwest and South Europe, Caucasus (?); frequently in montane belts, preferably in moss (BERNINI & BARATTI 1990). The type locality of this species is in the nearby Swiss National Park (SCHWEIZER 1956). New record for South Tyrol (also at the biodiversity day 2016). In the Matscher Tal single records in the larch forest LW1500_1 und LW1500_3, also found in larch pastures on the biodiversity day (SCHATZ 2017).

Gymnodamaeus meyeri BAYARTOGTOKH & SCHATZ, 2009 (Fam. Gymnodamaeidae): Second record of this recently described species, originally found in a dry habitat at Pfunds in North Tyrol, Austria (BAYARTOGTOKH & SCHATZ 2009); the type locality is situated in a linear distance of about 20 km from the Matscher Tal. The species seems to prefer arid habitats. In the Matscher Tal records in the larch forest LW1500_3. New record for South Tyrol and Italy.

Jugatala angulata (C.L. KOCH, 1840) (Fam. Ceratozetidae): General distribution: Alps, Central, Southeast Europe; preferably in mountainous and alpine habitats. In South Tyrol previous records at the Reschenpass (FISCHER & SCHATZ 2009) and in the Dolomites in the Armentara meadows near Wengen (SCHATZ & FISCHER 2014). In the Matscher Tal records in the dry meadow WE2000_3, in the larch forest LW1500_1 and LW1500_3 as well as in the Swiss pine forest ZW2000_3.

Licnodamaeus costula GRANDJEAN, 1931 (Fam. Licnodamaeidae): General distribution: dry grasslands in North Tyrol (SCHATZ & FISCHER 2015), South, Southwest Europe, northern Africa, Caucasus, southern palaearctic; preferably in arid habitats. New record for South Tyrol. In the Matscher Tal a single record in the dry meadow WE1000_3.

Licnodamaeus undulatus (PAOLI, 1908) (Fam. Licnodamaeidae): General distribution: Central, South Europe, northern Africa, Caucasus, southern palaearctic; preferably in arid habitats, also arboricolous. In South Tyrol previous records in the environment of Meran, Lana, Bozen, in warm and dry habitats (MIHELČIĆ 1965). In the Matscher Tal records in the dry meadow WE1000_1.

Paratritia baloghi MORITZ, 1966 (Fam. Oribotritiidae): General distribution: Central, West, South Europe, southern palaearctic; infrequent, the species seems to prefer dry habitats. New record for South Tyrol. In the Matscher Tal a single record in the Swiss pine forest ZW2000_3.

Pergalumna dorsalis (C.L. KOCH, 1841) (Fam. Galumnidae): General distribution: Europe, Caucasus, Central and East Asia, palaearctic. New record for South Tyrol [The record from SCHMÖLZER 1962 in the Brenner mountains is probably *Galumna lanceata* OUDEMANS, 1900. "*Galumna dorsalis*" sensu WILLMANN 1931 is *G. lanceata* according to WEIGMANN 2006]. In the Matscher Tal records in the dry meadows WE1000_1 and WE1000_3.

Phauloppia rauschenensis (SELLNICK, 1908) (Fam. Oribatulidae): General distribution: Europe, prevalent in South Europe, Caucasus, Central Asia (?); preferably in dry forests, also arboricolous. New record for South Tyrol, probably also recorded in the Prov. Sondrio (Val Masino, sub *Ph. cf. rauschenensis*, F. Bernini pers. comm.). In the Matscher Tal a single record in the dry meadow WE1000_1.

Provertex kuehnelti MIHELČIĆ, 1959 (Fam. Scutoverticidae): General distribution: Alps, Central, North Europe, "boreo-alpine distribution" (HEIN et al. 2013); recorded in the karst landscape around Trieste (MIHELČIĆ 1966); preferably in lichens, moss and cushion plants, saxicolous (KRISPER & SCHUSTER 2001). In South Tyrol previous records in the Dolomites on the Schlern in subalpine grassland (SCHATZ 2008). In the Matscher Tal single records in dry meadows WE1500_2 und WE2000_1.

Quadroppia hammerae MINGUEZ, RUIZ & SUBÍAS, 1985 (Fam. Quadropiidae): General distribution: palaearctic, Central America, New Zealand; preferably in forest soils. In South Tyrol previous records in the Armentara meadows near Wengen and on the Schlern (SCHATZ 2008, SCHATZ & FISCHER 2014). In the Matscher Tal a single record in the Swiss pine forest ZW2000_2.

Schelorbates (Topobates) holsaticus (WEIGMANN, 1969) (Fam. Schelorbatiidae): General distribution: Central, West, Southwest Europe; rare. This species seems to prefer moist meadows (WEIGMANN 2006). In South Tyrol a previous record in Castelfeder hill near Auer (HÖPPERGER & SCHATZ 2013). In the Matscher Tal only in the fertilized meadows MW1500_1, 2, 3, but in considerable numbers.

Suctobelbata prelli (MÄRKEL & MEYER, 1958) (Fam. Suctobelbidae): General distribution: Central, South Europe, Canada; rare. In South Tyrol previous records at the Reschenpass in a larch pasture (FISCHER & SCHATZ 2009). In the Matscher Tal a single record in larch forest LW1500_1.

Tectocepheus tenuis KNÜLLE, 1954 (Fam. Tectocepheidae): General distribution: Central, East Europe, Central Asia, palaearctic; rare, preferably in arid habitats. In South Tyrol previous records on Castelfeder hill near Auer (HÖPPERGER & SCHATZ 2013). In the Matscher Tal single records in dry meadow WE2000_1. This species is considered as subspecies or as synonym of *T. velatus* (MICHAEL, 1880) by various authors, but it differs in morphology as well as in ecological habitat requirements from other members of the species complex around *T. velatus* (WEIGMANN 2002, 2006).

Zusammenfassung

Hornmilben (Acari: Oribatida) in den LTSEr-Untersuchungsflächen in Matsch (Südtirol, Italien) – Erhebungen im Rahmen der Forschungswoche 2016

Im Rahmen des Projektes "Long-Term Socio-economic and Ecosystem Research" im Matscher Tal (Gemeinde Mals im Vinschgau) wurde die Artenvielfalt der Hornmilben (Acari, Oribatida) untersucht. Dazu wurden Boden- und Streuproben von charakteristischen Kleinlebensräumen in folgenden Standorten entnommen: Trockenweiden auf etwa 1000, 1500, 2000 m Meereshöhe, Mahdwiesen (ca. 1500 m ü.M.), lichter Lärchenwald (ca. 1500 m ü.M.), und im Zirbenwald (ca. 2000 m ü.M.), jeweils in drei Flächen. Insgesamt wurden 119 Arten aus 41 Familien gefunden. *Gymnodamaeus meyeri* BAYARTOGTOKH & SCHATZ, 2009 stellt eine Neumeldung für Italien dar; der einzig bisherige Fundort dieser Art liegt im nahegelegenen Nordtiroler Inntal. *Eobrachychthonius latior* (BERLESE, 1910) *Feiderzetes latus* (SCHWEIZER, 1956), *Licnodamaeus costula* GRANDJEAN, 1931, *Paratritia baloghi* MORITZ, 1966, *Pergalumna dorsalis* (C.L. KOCH, 1841), *Phauloppia rauschenensis* (SELLNICK, 1908) sind Neumeldungen für Südtirol. Die meisten Arten zeigen eine weite allgemeine Verbreitung – paläarktisch, holarktisch oder weiter bis semi/kosmopolitisch, andere weisen ein begrenztes Verbreitungsmuster auf, das auf Mitteleuropa und die Alpen beschränkt ist. Eine bemerkenswert hohe Zahl von Arten kann als „mediterranean“ oder „südlich“ bezeichnet werden. Ihr Verbreitungsschwerpunkt liegt in Süd- und Südosteuropa bzw. in der südlichen Paläarktis. Der Anteil dieser Arten ist in

den Trockenweiden auf 1000 m ü.M. am höchsten und nimmt in den höhergelegenen Standorten ab. In den Trockenweiden dominieren xerophile bzw. xerobionte Arten, in den Lärchenwäldern und im Zirbenwald silvicole Arten. Übereinstimmungen im Artbestand (Sørensen Index) sind zwischen den Waldflächen Zirbenwald und Lärchenwälder am höchsten, in diesen beiden Lebensräumen wurden die höchsten Artenzahlen gefunden (je 70 Arten), sowie zwischen den Trockenweiden. Einige faunistisch bemerkenswerte Arten und ihre allgemeine Verbreitung und Habitatpräferenzen werden vorgestellt.

Riassunto

Oribatidi (Acari: Oribatida) dell' area di ricerca del LTSE in Val di Mazia (Prov. Bolzano, Italia) – Risultati ottenuti nell'ambito della settimana della scienza 2016

Gli Acari Oribatidi sono stati investigati nell'ambito di "ricerche socio-economiche ed ecosistemiche a lungo termine" in Val di Mazia / Matscher Tal (comune di Malles Venosta / Mals), Val Venosta, Alto Adige. Campioni di suolo e lettiera sono stati raccolti in microhabitat caratteristici nei seguenti siti: praterie aride e pascoli a 1000, 1500 e 2000 metri s.l.m., prati concimati (1500 m s.l.m.), pascoli boscati a larice (1500 m s.l.m.) e boschi di pino cembro (circa a 2000 m s.l.m.), con tre repliche in ciascun sito. In totale sono state censite 119 specie di 41 famiglie. La specie *Gymnodamaeus meyeri* BAYARTOGTOKH & SCHATZ, 2009 è un dato nuovo per l'Italia, *Eobrachychthonius latior* (BERLESE, 1910), *Feiderzetes latus* (SCHWEIZER, 1956), *Licnodamaeus costula* GRANDJEAN, 1931, *Paratritia baloghi* MORITZ, 1966, *Pergalumna dorsalis* (C.L. KOCH, 1841) e *Phauloppia rauschenensis* (SELLNICK, 1908) sono dati nuovi per l'Alto Adige. La maggior parte delle specie ha una distribuzione generale ampia – paleartica, olartica o subcosmopolita, altre mostrano una distribuzione ristretta all'Europa Centrale e alle Alpi. Un notevole numero di specie può essere classificato come „specie meridionali“ (centro di distribuzione nell'Europa Meridionale o nella Regione Paleartica Meridionale). La percentuale di queste specie è più alta nelle praterie aride basse (a circa 1000 m s.l.m.), e cala con l'altitudine. Le associazioni di specie nei differenti siti sono dominate da specie xerofile nelle praterie aride e da specie silvicole nei pascoli boscati a larice e nei boschi di pino cembro. I coefficienti di similarità (indice di Sørensen) sono più alti tra i siti boscati: pascoli boscati a larice e boschi di pino cembro, entrambi con il più alto numero di specie (70 specie ciascuno), e tra le praterie aride. Vengono presentate alcune specie notevoli e la loro distribuzione generale e i loro requisiti di habitat vengono discussi in dettaglio.

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