Oribatid mites (Acari: Oribatida) from the "Isola del Garda" (Lake Garda, Prov. Brescia, Italy)

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Oribatid mites (Acari: Oribatida) from the "Isola del Garda" (Lake Garda, Prov. Brescia, Italy)

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ABSTRACT Contrib. Nat. Hist. 12: 1125–1149.

"Isola del Garda" is the largest island in the Lake Garda, Northern Italy, at the southern slope of the Alps. A park with numerous exotic trees was planted on the island. Leaf litter samples taken in this park contain 37 oribatid species belonging to 26 families. A detailed general distribution of all species, especially in the Alps and in southern Europe, is given. All species on the island are known from southern European countries, half of them can be considered as "southern species". Remarkable findings are *Licnobelba latiflabellata* (Paoli, 1908), *Papillacarus aciculatus* (Berlese, 1904), *Ramusella elongata* (Paoli, 1908), *Oribatula caliptera* Berlese, 1902, which were not known from the Alps before, as well as a new species, *Eohypochthonius benacensis* H. Schatz sp. nov. which is described and figured. Possible reasons for the presence of this species are discussed.

Introduction

Since the intensive collectings of Antonio Berlese (1863–1927, see Castagnoli & Pegazzano 1985, Ragusa 2002) only few Acarologists have reported oribatid mites from the Italian Alps (e.g. Caroli & Maffia 1934, Maffia 1934, Valle 1955, Lombardini 1962, Zangheri 1963, Marcuzzi 2003, Migliorini & al. 2003). Recently, several studies were carried out, mainly in the region Trentino – Alto Adige (Baratti & al. 2003, Schatz 2005a, 2005b, 2005c, Schatz & Gerecke 1996, and others, data included in Schmölzer & Hellrigl 1996).

During a visit of the Isola del Garda in 2004 some leaf litter samples were taken in the park, thanks to the generous permission of the owner of the island, Alberta Cavazza-Borghese. These samples contain a number of interesting oribatid mites which are presented in the following.

This study is dedicated to the memory of our late teacher and friend Konrad Thaler (1940–2005) who supported our work in many ways and initiated the interest of one of us (HS) in oribatid mites.

Environmental setting

The Lake Garda is the largest of the Italian lakes with a surface of 370 km^2, at an altitude of 65 m a.s.l. It is a typical glacier lake in a tectonic basin on the southern slope of the Alps, surrounded by the Monte Baldo massif in the East and the Judicarian Alps in the West. The mountains around the lake are built from limestone deposits, mostly of Jurassic origin. Between Toscolano and Salò cretaceous sediments stretch towards the lake. The northern branch of Lake Garda reaches deep into the steep Alps, while the shore south of Salò is surrounded by a fertile moraine landscape extending into the plain of River Po, with some steep rocks from the cretaceous period like Rocca di Manerba opposite to the island.

The "Isola del Garda" is the largest (of the seven small) islands in the Lake Garda. It is situated in the southern part of the lake near Salò and San Felice del Benaco at a distance of only a few hundred meters from Capo San Fermo on the "mainland". The island has a long and narrow shape with a length of about 1500 m and a width of less than 800 m. The rocky eastern part of the island contains a villa in Newgothic-Venezian style and a garden. The western half is flat, only a few meters above lake level. Depressions were filled in with soil from the surrounding area. A park was set out since 1880. Numerous exotic trees and plants from different parts of the world were planted, such as the swamp cypress *Taxodium disticum*, *Cedrus libani*, *Sequoia sempervirens*, *Ginkgo biloba*, *Magnolia* trees, and others, but also the typical mediterranean vegetation of the surrounding area as *Quercus ilex*, *Cupressus sempervirens*, and undergrowth is present.

Material and Methods

Two samples were taken in different sites of the park:

Sample no. 1: Isola del Garda, Salò, Prov. Brescia, Italy, 22. 06. 2004; Park, 67 m a.s.l., under *Quercus ilex* shrubs, leaf litter from different sites, dry to moist, about 2 litres.

Sample no. 2: ibid., under *Quercus ilex* and *Cupressus sempervirens*, leaf litter from different sites, dry to moist, about 2 litres.

The samples were extracted automatically using a modified Tullgren-Berlese extraction apparatus with heating, the specimens are stored in 75% ethanol.

Results and Discussion

In the two samples, a total of 37 species belonging to 26 families were recorded. Sample no. 1 contains 26 oribatid species, sample no. 2 15 species. Only 6 species are present in both samples, and 10 species are represented by only one specimen. This high number of single specimens indicates that additional species and a higher species diversity can be expected on the island. The two samples taken on Isola del Garda are just a first orientation; more collecting should be done on the island as well as in the surroundings.

The following list contains records on the Isola del Garda, morphological data (as the case arises), additional records of each species in the Alps (Italian Alps: Prov. di Bergamo BG, Belluno BL, Brescia BS (with detailed records), Alto Adige-Bolzano BZ, Padova PD, Pordenone PN, Sondrio SO, Trento TN, Torino TO, Trieste TS, Treviso TV, Vicenza VI – Baratti & al. 2000 [1], Caroli & Maffia 1934 [2], Castagnoli & Pegazzano 1985 [3], Krisper 1983 [4], 1984 [5], 1987 [6], Marcuzzi 2003 [7], Schatz 2005a [8], 2005b [9], 2005c [10], Schatz & Gerecke 1996 [11], Schmölzer & Hellrigl 1996 [12], Valle 1955 [13], Zangheri 1963 [14], Austrian Alps: Krisper 1983 [3], Schatz 1983 [15], 1989 [16], 1990 [17], 1995 [18], 2005d [19], Totschnig & Schatz 1997 [20], Berchtesgadener Alps: Schatz & Gerecke 1996 [11], Swiss Alps: Schweizer 1956 [21], Mahunka 1993 [22], Mahunka & Mahunka-Papp 2001 [23], 2003 [24]), southern Europe (Italy: Bernini & al. 1995 [25], former Yugoslavia: Tarman 1977 [26], 1983 [27], Bulgaria: Cziszar & Jeleva 1962 [28], Kunst 1957 [29], 1958 [30], 1959 [31], 1961 [32], Romania: Vasiliu & al. 1993 [33], Ukraine: Pavlichenko 1994 [34], Sergienko 1994 [35], Ukraine-Crimea: Gordeeva 1973 [36], Greece: Flogaitis 1992 [37], Mahunka 1974 [38], Mahunka 2001 [39], Weigmann 2006 [40], southern France: Grandjean 1951 [41], Iberian Peninsula: Subias & Arillo 2004 [42]), as well as their general distribution (data from Subias 2008, Weigmann 2006, Schatz unpubl.).

Fam. Achipteriidae

Achipteria coleoptrata (Linnaeus, 1758)

Isola del Garda: no. 1: 2 ad. (length 620–650 µm).

Alps: Italian Alps – BG, BL, BZ, TN [1, 3, 7, 8, 9, 11, 12], Austrian Alps [15, 16, 17, 19], Swiss Alps [21].

Southern Europe: Italy – North, South, Sicily, Sardinia [25], Slovenia, Croatia, Serbia, Bosnia-Herzegovina, Macedonia [27], Bulgaria [30, 31, 32], Romania [33], Greece [37], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus; Holarctic.

Achipteria nitens (Nicolet, 1855)

Isola del Garda: no. 2: 1 ad. (length 670 µm).

Alps: Italian Alps – BG, BL, BZ, TN [1, 3, 8], Austrian Alps [15, 19, 20], Swiss Alps [21].

Southern Europe: Italy – North, South, Sicily [25], Slovenia, Bosnia-Herzegovina [27], Bulgaria [29, 30, 32], Romania [33], Ukraine-Crimea [36], Iberian Peninsula [42 (sub *A. acuta*)].

General distribution: Central, southern and northern Europe, Caucasus, North Africa; Holarctic.

Fam. Camisiidae

Camisia segnis (Hermann, 1804)

Isola del Garda: no. 1: 1 ad.

Alps: Italian Alps – BZ, TN [3, 8, 9, 10, 12, 13], Austrian Alps [15, 18, 19, 20], Swiss Alps [21].

Southern Europe: Italy – North, South [25], Slovenia, Serbia [27], Bulgaria [29, 30, 31, 32], Romania [33], Ukraine [35], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus, North Africa; Holarctic, Oriental, South America, New Zealand, Subantarctic.

Platynothrus peltifer (C. L. Koch, 1839)

Isola del Garda: no. 2: 9 ad.

Alps: Italian Alps – BG, BL, BS: Gardone Riviera, BZ, PN, SO, TN [1, 3, 7, 8, 9, 10, 11, 12], Austrian Alps [15, 16, 17, 18, 19, 20], Swiss Alps [21].

Southern Europe: Italy – North, South, Sicily [25], Slovenia, Croatia, Bosnia-Herzegovina, Montenegro, Macedonia [27], Bulgaria [29, 30, 32], Romania

[33], Ukraine [35], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus, North Africa; Holarctic, western Oriental, New Zealand.

Fam. Ceratozetidae

Ceratozetes mediocris Berlese, 1908

Isola del Garda: no. 1: 2 ad. (length 380–410 µm).

Alps: Italian Alps – BZ, TN [2, 10], Austrian Alps [15, 19].

Southern Europe: Italy – North, South [25], Slovenia, Croatia, Serbia, Bosnia-Herzegovina, Macedonia [27], Bulgaria [29, 30], Romania [33], Ukraine [34], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus; Holarctic, Oriental, Ethiopian, New Zealand.

Ceratozetes peritus Grandjean, 1951

Isola del Garda: no. 1: numerous (length 580–600 µm), no. 2: 1 ad.

Alps: Italian Alps – TN [Schatz unpubl.], Austrian Alps [16, 18, 19].

Southern Europe: Slovenia, Croatia, Serbia, Bosnia-Herzegovina, Macedonia [27], Romania [33], Ukraine [34], Ukraine-Crimea [36], Greece [39], France [41], Iberian Peninsula [42].

General distribution: Central and southern Europe, Caucasus; Holarctic.

Fam. Chamobatidae

Chamobates cuspidatus (Michael, 1884)

Isola del Garda: no. 1: 8 ad., no. 2: 5 ad. (length 340–355 µm).

Alps: Italian Alps – BZ [8, 9, 11], TN [Schatz unpubl], Austrian Alps [15, 16, 20].

Southern Europe: Italy – North, South [25], Slovenia, Croatia, Serbia, Bosnia-Herzegovina, Montenegro, Macedonia [27], Bulgaria [32], Romania [33], Ukraine [34], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus, North Africa; Holarctic, western Oriental, Madagascar.

Fam. Ctenobelbidae

Ctenobelba pectinigera (Berlese, 1908)

Isola del Garda: no. 1: 1 ad. (partly destroyed).

Alps: Italian Alps – BG, BZ, TN [1, 3, 8], Austrian Alps [15, 16, 18, 19], Swiss Alps [21].

Southern Europe: Italy – North, South, Sicily [25], Slovenia, Serbia, Bosnia-Herzegovina, Montenegro, Macedonia [27], Bulgaria [28], Romania [33], Iberian Peninsula [42].

General distribution: Central and southern Europe, Caucasus, Kazakhstan, North Africa; western Palaearctic.

Fam. Damaeidae

Metabelba papillipes (Nicolet, 1855)

Isola del Garda: no. 1: 1 ad. (length 420 µm).

Alps: Italian Alps – BZ, TN [1, 8], Austrian Alps [Schatz unpubl.].

Southern Europe: Italy – North [25], Slovenia, Serbia [27], Romania [33], Iberian Peninsula [42].

General distribution: Central and southern Europe, Caucasus, North Africa; Holarctic, western Oriental, New Zealand.

Fam. Eniochthoniidae

Eniochthonius minutissimus (Berlese, 1904)

Isola del Garda: no. 1: 1 ad.

Alps: Italian Alps – BG, BS: Gardone Riviera, BZ, TN [1, 3 (sub *Hypochthonius pallidulus*), 8, 10], Austrian Alps [15, 18, 19].

Southern Europe: Italy – North, South [25], Slovenia, Croatia, Bosnia-Herzegovina, Macedonia [27], Bulgaria [28], Romania [33], Ukraine [35], Ukraine-Crimea [36], Greece [37], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus; Holarctic, Oriental, Madagascar, South America, Australia, New Zealand, Pacific.

Fam. Euphthiracaridae

Rhysotritia ardua (C. L. Koch, 1841)

Isola del Garda: no. 1: 1 ad.

Alps: Italian Alps – BZ, SO, TN, TO [3, 8, 10], Austrian Alps [15, 17, 18, 19, 20], Swiss Alps [21 (sub *R. canestrinii*), 22, 24].

Southern Europe: Italy – North, South, Sicily, Sardinia [25], Slovenia, Croatia, Serbia, Bosnia-Herzegovina, Montenegro, Macedonia [27], Bulgaria [32], Romania [33], Greece [37], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus, North Africa; cosmopolitan.

Fam. Galumnidae

Acrogalumna longipluma (Berlese, 1904)

Isola del Garda: no. 1: 1 male (length 680 µm).

Alps: Italian Alps – BG, BL, BZ [3, 12], TN [Schatz unpubl.], Austrian Alps [15, 16, 18], Swiss Alps [21, 22].

Southern Europe: Italy – North, South, Sicily, Sardinia [25], Slovenia, Croatia [26], Bulgaria [30, 31, 32], Romania [33], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe; Holarctic, Ethiopian, western Oriental, New Zealand.

Pergalumna nervosa (Berlese, 1914)

Isola del Garda: no. 2: numerous (length 730 µm).

Alps: Italian Alps – TN [1], Austrian Alps [15, 18], Swiss Alps [21].

Southern Europe: Italy – North, South, Sardinia [25], Slovenia, Croatia, Serbia, Bosnia-Herzegovina, Montenegro, Macedonia [27], Bulgaria [29, 30], Romania [33], Ukraine-Crimea [36], Greece [37], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus; Holarctic, Ethiopian, western Oriental.

Fam. Gustaviidae

Gustavia microcephala (Nicolet, 1855)

Isola del Garda: no. 1: 9 ad.

Alps: Italian Alps – BZ, PD, TN [3 (sub *G. sol*), 8, 13], Austrian Alps [15, 19].

Southern Europe: Italy – North, South [25], Slovenia, Croatia, Bosnia-

Herzegovina [27], Romania [33], Ukraine-Crimea [36], Greece [38], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus, North Africa; Palaearctic, Central America.

Fam. Gymnodamaeidae

Arthrodamaeus femoratus (C. L. Koch, 1840)

Isola del Garda: no. 1: 1 ad.

Alps: Italian Alps – BL, BS: Desenzano PD, TN [3, 13].

Southern Europe: Italy – North, South, Sicily, Sardinia [25], Slovenia, Macedonia [26], Bulgaria [30], Romania [33], Ukraine-Crimea [36], Iberian Peninsula [42].

General distribution: Central and southern Europe, Caucasus, North Africa; Palaearctic, western Oriental region.

Fam. Hypochthoniidae

Eohypochthonius benacensis H. Schatz sp. nov.

Description see below.

Isola del Garda: no. 1: 1 ad.

Fam. Liacaridae

Xenillus clypeator Robineau-Desvoidy, 1839

Isola del Garda: no. 1: 2 ad.

Alps: Italian Alps – BZ [8], Swiss Alps [21 (sub *X. latus*)].

Southern Europe: Italy – North, South, Sicily [25], Slovenia [27], Croatia [26], Macedonia [27], Bulgaria [29, 30, 31, 32], Romania [33], Greece [37], Iberian Peninsula [42].

General distribution: Central and southern Europe, Caucasus; Holarctic.

Xenillus tegeocranus (Hermann, 1804)

Isola del Garda: no. 1: 2 ad.

Alps: Italian Alps – BL, BZ, PD, TN, VI [1, 3, 8, 9, 10, 12, 13], Austrian Alps [15, 16, 17, 18, 19, 20].

Southern Europe: Italy – North, South, Sicily [25], Slovenia, Croatia, Bosnia-Herzegovina, Macedonia [27], Bulgaria [29, 30, 31, 32], Romania [33], Ukraine-Crimea [36], Greece [37], Iberian Peninsula [42].

General distribution: Central and southern Europe, Caucasus, North Africa; Palaearctic, western Oriental region.

Fam. Licnobelbidae

Licnobelba latiflabellata (Paoli, 1908)

Isola del Garda: no. 1: 3 ad.

Southern Europe: Italy – North, South, Sicily, Sardinia [25], Bulgaria [28 (sub *L. alestensis*)], Romania [33], Iberian Peninsula [42].

General distribution: Central and southern Europe, Caucasus, North Africa; Palaearctic.

Fam. Lohmanniidae

Papillacarus aciculatus (Berlese, 1904)

Isola del Garda: no. 1: 2 ad.

Southern Europe: Italy – South, Sicily, Sardinia [25], Bulgaria [31], Ukraine [35], Ukraine-Crimea [36], Iberian Peninsula [42].

General distribution: Southern Europe, Hungary, Caucasus, North Africa; southern Palaearctic, eastern Oriental region.

Fam. Malaconothridae

Trimalaconothrus tardus (Michael, 1888)

Isola del Garda: no. 2: 4 ad.

Alps: Austrian Alps [15].

Southern Europe: Italy – North, South, Sardinia? [25], Bulgaria [28], Romania [33], Iberian Peninsula [42].

General distribution: Central and southern Europe, Caucasus; Palaearctic, China, New Zealand.

Fam. Micreremidae

Micreremus brevipes (Michael, 1888)

Isola del Garda: no. 1: 1 ad.

Alps: Italian Alps – BZ, TV [3, 10], Austrian Alps [15, 20].

Southern Europe: Italy – North, South, Sicily, Sardinia [25], Slovenia, Serbia [27], Bulgaria [28], Romania [33], Greece [37], Iberian Peninsula [42].

General distribution: Central and southern Europe, Caucasus; western Palaearctic.

Fam. Oppiidae

Oppia nitens (C. L. Koch, 1835)

Isola del Garda: no. 1: 5 ad. (length 510 µm), no. 2: 6 ad.

Alps: Italian Alps – BZ [8, 9, 10, 12], Austrian Alps [15], Swiss Alps [21].

Southern Europe: Italy – North [25], Slovenia, Croatia, Serbia, Bosnia-Herzegovina, Macedonia [27], Bulgaria [28], Romania [33], Ukraine-Crimea [36], Greece [37, 40], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus, North Africa; Holarctic.

Oppiella (*Rhinoppia*) *subpectinata* (Oudemans, 1900)

Isola del Garda: no. 1: 11 ad.

Alps: Italian Alps – BZ, TN [Schatz unpubl.], Austrian Alps [15, 16, 18, 20], Swiss Alps [21].

Southern Europe: Italy – North, South [25], Slovenia, Croatia, Serbia, Bosnia-Herzegovina, Montenegro, Macedonia [27], Bulgaria [32], Romania [33], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus; Holarctic, Ethiopian.

Oppiella nova (Oudemans, 1902)

Isola del Garda: no. 1: 2 ad.

Alps: Italian Alps – BG, BL, BZ, TN [1, 3 (sub *Dameosoma corrugatum*), 7, 8, 9, 10, 12 (sub *Oppia corrugata*, *Oppia neerlandica*?), 14], Austrian Alps [15, 16, 17, 18, 19, 20], Swiss Alps [21 (sub *Oppia corrugata*)].

Southern Europe: Italy – North, South, Sicily, Sardinia [25], Slovenia, Croatia, Bosnia-Herzegovina, Macedonia [27], Bulgaria [28], Romania [33], Ukraine-Crimea [36], Greece [37], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus, North Africa; cosmopolitan.

Ramusella (*Insculptoppiella*) *elongata* (Paoli, 1908)
Isola del Garda: no. 1: 13 ad. (length 480–490 µm).
Southern Europe: Italy – North, South, Sardinia [25], Iberian Peninsula [42].
General distribution: Central and southern Europe.

Fam. Oribatellidae

Oribatella hungarica Balogh, 1943
Isola del Garda: no. 2: 3 ad. (length 330 µm).
Alps: Austrian Alps [18].
Southern Europe: Italy – North, South [25], Bulgaria [28], Romania [33].
General distribution: Central and southern Europe.

Fam. Oribatulidae

Oribatula caliptera Berlese, 1902
Taxonomic remarks: see Mahunka (1994).
Isola del Garda: no. 1: 23 ad., no. 2: 12 ad. (length 335–350 µm).
Southern Europe: Italy – North, South [3, 25].
General distribution: Southern Europe.

Fam. Phenopelopidae

Eupelops nepotulus (Berlese, 1916)
Taxonomic remarks: see Mahunka (1992).
Isola del Garda: no. 1: 8 ad. (length 500–520 µm).
Alps: Italian Alps – "Alta Italia" [3], TN [Schatz unpubl.], Austrian Alps [15, 18, 20], Swiss Alps [21].
Southern Europe: Italy – North, South [25], Iberian Peninsula [42].
General distribution: Central, southern and northern Europe, Caucasus; western Palaearctic.

Atropacarus striculus (C. L. Koch, 1836)

Isola del Garda: no. 1: 1 ad.

Alps: Italian Alps – BL, BZ, TN [1, 3, 9, 10], Austrian Alps [15, 16, 17, 18, 19, 20], Swiss Alps [21, 24].

Southern Europe: Italy – North, South [25], Slovenia, Croatia, Serbia, Bosnia-Herzegovina, Macedonia [27], Bulgaria [29, 30, 32], Romania [33], Ukraine [35], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus, North Africa; Holarctic, Oriental, Central America, Hawaii.

Phthiracarus crinitus (C. L. Koch, 1841)

Isola del Garda: no. 1: 3 ad., no. 2: 2 ad.

Alps: Italian Alps – TN [Schatz unpubl.], Austrian Alps [16, 17].

Southern Europe: Italy – North [25], Bulgaria [28], Iberian Peninsula [42].

General distribution: Central and southern Europe, Caucasus; western Palaearctic.

Steganacarus magnus/anomalus (Nicolet, 1855)

Isola del Garda: no. 2: 2 ad.

Alps: Italian Alps – PD (*S. magnus*) [13], TN (*S. magnus*) [3], Austrian Alps (*S. magnus*) [15], Berchtesgadener Alps [11 (*S. magnus*)], Swiss Alps (*S. magnus*) [24].

Southern Europe: Italy – North, South, Sicily, Sardinia [25 (*S. anomalus* considered as synonym of *S. magnus*)], Slovenia (*S. magnus*, also *S. anomalus* [Schuster pers. comm.], Croatia (*S. magnus*) [27], Montenegro (*S. magnus*, also *S. anomalus* [Schuster pers. comm.], Macedonia (*S. anomalus*) [26], Bulgaria (*S. anomalus*) [28], (*S. magnus*) [29], Romania (also *S. anomalus*) [33], Ukraine (*S. magnus*) [35], Ukraine-Crimea (*S. magnus*) [36], Greece (*S. anomalus*) [37], Iberian Peninsula (*S. magnus*) [42].

General distribution: Central, southern and northern Europe (*S. magnus*, also *S. anomalus*), Caucasus (*S. magnus*), North Africa (*S. magnus*); Holarctic, Ethiopian (*S. magnus*), southern Palaearctic (*S. anomalus*).

Fam. Scheloribatidae

Scheloribates pallidulus (C. L. Koch, 1840)

Isola del Garda: no. 2: 6 ad. (length 420–460 µm).

Alps: Italian Alps – BZ, TN [Schatz unpubl.], Austrian Alps [15, 19, 20], Swiss Alps [21].

Southern Europe: Italy – North, South, Sicily, Sardinia [25], Slovenia, Croatia, Serbia, Bosnia-Herzegovina, Montenegro, Macedonia [27], Bulgaria [31], Romania [33], Ukraine-Crimea [36], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus; Holarctic, western Oriental, Nearctic, Neotropical region.

Fam. Suctobelbidae

Suctobelbella acutidens (Forsslund, 1941)

Isola del Garda: no. 1: 1 ad.

Alps: Italian Alps – BZ [8, 10], Austrian Alps [15, 17, 19], Swiss Alps [23].

Southern Europe: Italy – North, South, Sicily [25], Slovenia, Croatia [27], Romania [33], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus, North Africa; Holarctic, western Oriental region.

Fam. Trhypochthoniidae

Trhypochthonius tectorum (Berlese, 1896)

Isola del Garda: no. 2: 6 ad., 2 juv.

Alps: Italian Alps – BZ, TN [1, 3, 10, 12], Austrian Alps [15, 16, 18, 19, 20], Swiss Alps [21].

Southern Europe: Italy – North, South, Sardinia [25], Slovenia, Croatia, Macedonia [27], Bulgaria [28], Romania [33], Ukraine [35], Ukraine-Crimea [36], Greece [37], Iberian Peninsula [42].

General distribution: Central, southern and northern Europe, Caucasus, North Africa; Holarctic, Oriental, Neotropical region.

Zetorchestes falzonii Coggi, 1898

Isola del Garda: no. 1: 16 ad. (length 510–540 µm), no. 2: 2 ad.

Alps: Italian Alps – BL, BG, BS: Salò, Valvestino, Lago d'Idro, Valle Toscolano, BZ, TN, TS [3, 5, 6, 8, 12]), Austrian Alps [15 (sub *Z. micronychus*)].

Southern Europe: Italy – North, South, Sardinia [25], Slovenia, Croatia [27 (sub *Z. micronychus*)], Greece [37 (sub *Z. micronychus*)], Romania [33 (sub *Z. ?micronychus*)].

General distribution: Central and southern Europe, Caucasus, North Africa; south-western Palaearctic.

Zetorchestes flabrarius Grandjean, 1951

Isola del Garda: no. 1: 1 ad. (length 480 µm).

Alps: Italian Alps – BS: Valle Toscolano, BZ [4, 6, 8], Austrian Alps [3].

Southern Europe: Italy – North [25], Bulgaria [28, 29 (sub *Z. micronychus*), 31, 32], Iberian Peninsula [42].

General distribution: Central and southern Europe, Caucasus, North Africa; south-western Palaearctic.

Zoogeographical considerations

Fig. 1 shows the distribution of the species recorded on the Isola del Garda in different zoogeographical areas. All 37 species are known from southern Europe (data from southern France are incomplete, but the southern distribution of the species is covered by records in other southern European countries). Among them, 19 have a wide distribution in Europe and were also found in northern countries. On the other hand, the remaining 18 species can be considered are "southern species" (see also Tarman 1977): *Arthrodamaeus femoratus*, *Ceratozetes peritus*, *Ctenobelba pectinigera*, *Eohypochthonius benacensis* sp. nov. (?), *Licnobelba latiflabellata*, *Metabelba papillipes*, *Micreremus brevipes*, *Oribatella hungarica*, *Oribatula caliptera*, *Papillacarus aciculatus*, *Phthiracarus crinitus*, *Ramusella* (*Insculptoppiella*) *elongata*, *Steganacarus magnus/anomalus*, *Trimalaconothrus tardus*, *Xenillus clypeator*, *X. tegeocranus*, *Zetorchestes falzonii*, Z. *flabrarius*. Most species (31 spp.) are known from the Alps (Italian Alps 29 spp., Austrian Alps 29 spp., Swiss Alps 17 spp.), 5 species were already recorded in the Province of Brescia (Gardone Riviera: *P. peltifer*, *E. minutissimus*, Judicarian Alps: *Z. falzonii*, *Z. flabrarius*, Desenzano: *A. femoratus*).

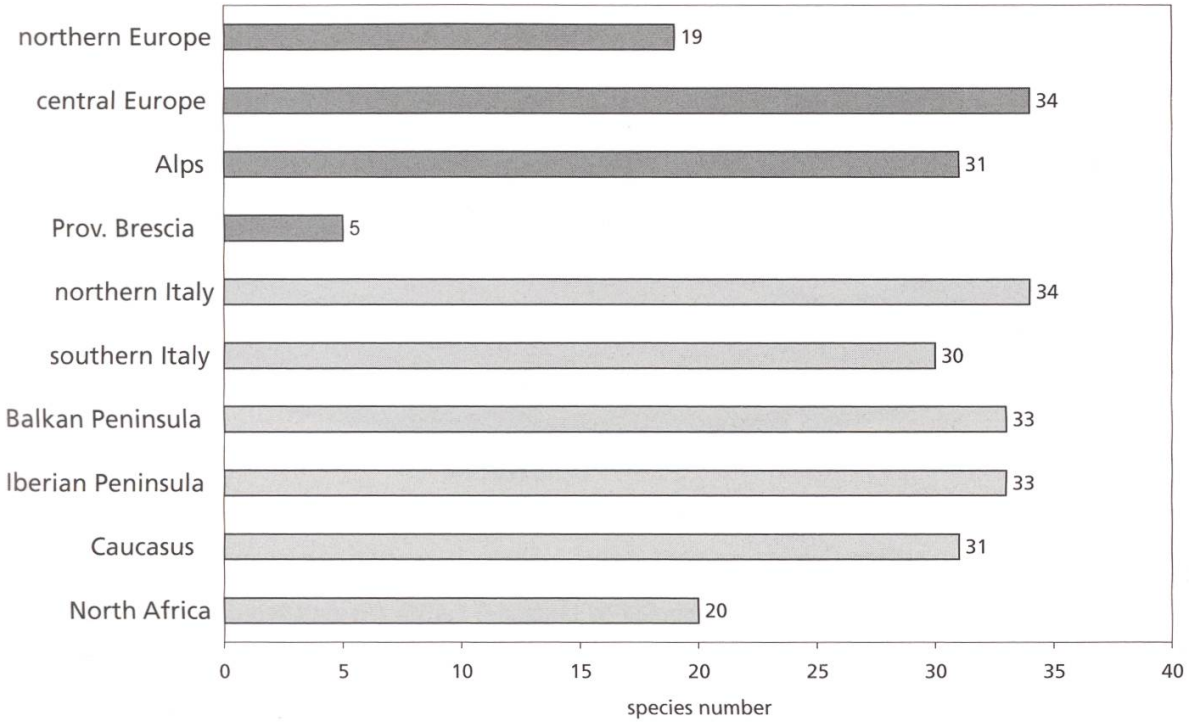

Fig. 1. Distribution of oribatid species on Isola del Garda in different surrounding and European areas.

Most species have a wide general distribution (Fig. 2), but the known distribution of ten species (including *Steganacarus magnus* f. *anomalus*) is restricted to the western Palaearctic region. Among them *Ramusella elongata*, *Papillacarus aciculatus*, *Oribatella hungarica* and *Oribatula caliptera* were only recorded in central and southern Europe. Prior to this study *Oribatula caliptera* was not known from the Alps. The Isola del Garda is the northernmost known record for this species. The next locality of *O. caliptera* is near Cremona (Castagnoli & Pegazzano 1985). It can be assumed that most recorded species are autochthonous to the region with one exception: one of the most remarkable and mysterious species recorded on Isola del Garda is *Eohypochthonius benacensis* sp. nov.

Eohypochthonius benacensis H. Schatz sp. nov. (Figs. 3–5)

Material examined: Holotype 1 adult, Italy, Prov. Brescia, Isola del Garda, Salò, 22. 06. 2004; Park, 67 m a.s.l., under *Quercus ilex* shrubs, dry to moist leaf litter (leg. Heinrich and Irene Schatz). The alcohol preserved adult holotype will be deposited in: Muséum d'histoire naturelle, Genève, Switzerland.

Diagnosis: The new species differs from its congeners in the adult instar by the following combination of character states: surface with microsculpture,

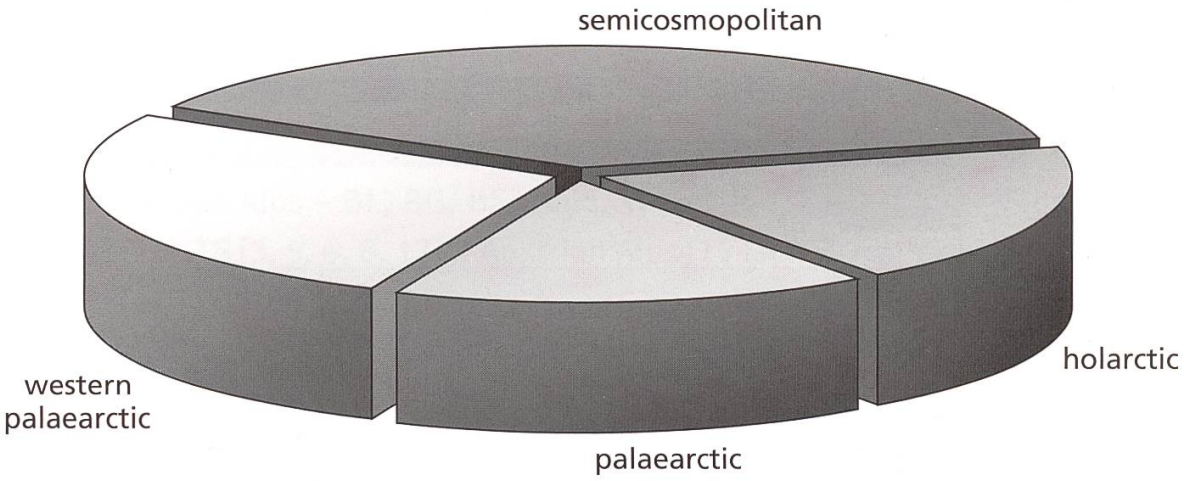

Fig. 2. General distribution of oribatid species in Isola del Garda ("semicosmopolitan": Holarctic region and wider).

interlamellar setae spoon-shaped, lamellar and notogastral setae slightly dilated with folded edges, sensillus with 12 branches, without barbs on opposite side of stem, posterior notogastral setae bent around posterior margin of notogaster.

Description of the holotype: Length 265 µm, width 115 µm. Colour yellow to light brown. Surface of prodorsum, notogaster, mentum, epimeral and ventral region, genital, anal plates and legs with dotted microsculpture, forming reticulate or vermiforme structures.

Prodorsum: Rostrum rounded. Anterior part of prodorsum with a thickened, nose-shape protuberance. A small elevated ridge on each side of prodorsum present between anterior exobothridial setae and lamellar setae. Cochlea-shaped tecta ("Kuticularzapfen" sensu Beck 1962, see Aoki 1977) posterior to exobothridial setae large, spoon-shaped and directed posteriad. A small transversal ridge present between bothridia. Prodorsal setae smooth, rostral setae originating on protuberance, directed anteriad, attenuating, length 25 µm, lamellar setae directed posteriad, slightly dilated with folded edges, length 29 µm, interlamellar setae with small stalk and spoon-shaped thickening distally, length 18 µm, anterior exobothridial setae directed mediad, attenuating, length 15 µm, posterior exobothridial setae thin, length 6 µm. Sensilli with 12 branches each, no branches discernible on opposite side of sensillus stem.

Notogaster: Shape long and narrow, with transverse scissure (of type "S" in the sense of Grandjean 1947, see Norton 2001). Sixteen pairs of notogastral setae present. Setae *e* vestigial, originating at transverse scissure. Other notogastral setae smooth, slightly dilated with folded edges forming a central furrow, distally attenuating, length of setae *c*, *d*, *f*, h_1 46–50 µm, reaching

insertion of next posterior row each, setae h_2, h_3 30–35 µm, setae *p* 20–25 µm. Setae of rows *h*, *p* bent around posterior margin of notogaster.

Gnathosoma: Subcapitulum anarthric, length 45 µm, width 37 µm, subcapitular setae setiform, setae *h* inserting on posterior edge of subcapitulum, curved anteriad, length *h* 8 µm, m_1, m_2, *a* 12 µm. Rutellum small, with 3 teeth distally. Length of palp 45 µm, tarsal setae *(ul)* fused, bifid, inserting on a common stem together with *sul*. Chelicereae not studied in detail.

Epimeral region: Epimeral plates I and II separate, plates III and IV almost completely fused on each side. Epimeral setal formula 3-1-3-4, all setae attenuating, length of setae 3b 12 µm, other epimeral setae 6–8 µm.

Genito-anal region: Genital plates with transverse furrow, aggenital plates forming small triangle on each side. Genito-anal setal formula 10-0-2-3, anterior and posterior genital plates with 5 setae each, anterior genital setae close to anterior margin of genital plates, all setae attenuating, length of inner genital setae 4–5 µm, outer genital setae 7–8 µm, anal setae 5 µm, adanal setae 8 µm.

Legs: Legs of moderate length (without claws 80–95 µm, 30–38% of body length), all legs monodactylous with a strong claw each (length 10 µm). Setal formulas of legs as in Bernini & al. (1986), all setae attenuating. Solenidia φ_1 on tibia I very long (length 60 µm), inserted on distal projection.

Etymology: The name is derived from the latin (and former Italian) name "Benacus" for Lake Garda.

Remarks: Prior to this study, 11 species of the genus *Eohypochthonius* s. l. had been described, mainly from tropical regions (*Eohypochthonius africanus* Mahunka, 1978 – Mauritius, *E. asiaticus* (Berlese, 1910, sensu Mahunka 1980) – Java, *E. becki* Balogh & Mahunka, 1979 – Cuba, *E. crassisetiger* Aoki, 1959 – eastern Palaearctic and Oriental region, Mariana Islands, *E. gracilis* (Jacot, 1936, sensu Beck 1962) – southern United States, eastern Palaearctic, Oriental and Neotropical region, Fiji Islands, *E. magnus* Aoki, 1977 – Japan, China, Minnesota, *E. parvus* Aoki, 1977 – Japan, China, Korea, ?west mediterranean, *E. salicifolius* Hammer, 1979 – Java, Borneo, *E. vermicularis* Hammer, 1979 – Java, *E. vilhenarum* (Balogh, 1958) – Zaire, India). *Eohypochthonius* (*Neoatrichosus*) *travei* Fernandez, 1984 (Argentina) was placed into a separate subgenus on the strength of narrow anal plates and the lack of anal setae.

The single specimen from the Isola del Garda shows a combination of morphological characters which differ from all known species of the genus. Comparable interlamellar setae are found in *E. asiaticus*, *E.* (*N.*) *travei* and *E. vilhenarum* ("setae interlamellares ad apicem leviter incrassatae", Balogh 1958). The species *E. becki*, *E. crassisetiger*, *E. gracilis*, *E. salicifolius*, *E. vermicularis*

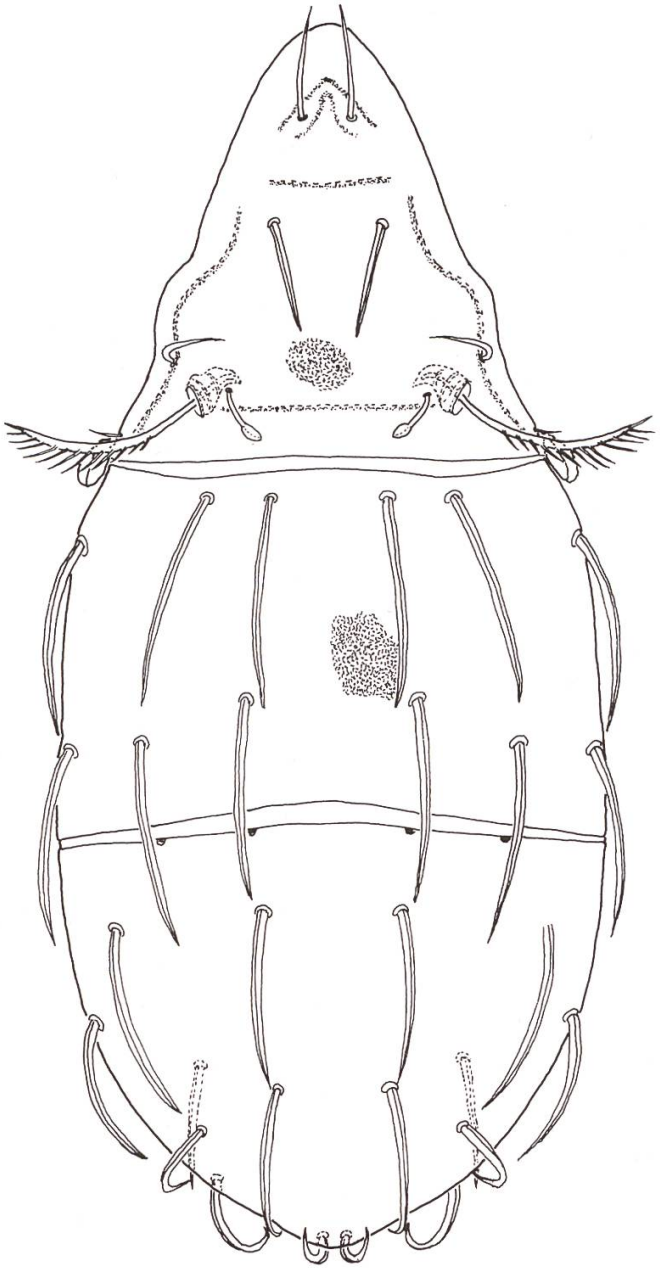

Fig. 3. ***Eohypochthonius benacensis*** **H. SCHATZ sp. nov., dorsal view (Scale bar: 100 µm).**

have broad, but not spoon-shaped interlamellar setae. A sculptured surface is known from *E. africanus*, *E. becki* (?), *E. gracilis*, *E. magnus*, *E. salicifolius*, *E.* (*N.*) *travei*, *E. vermicularis*, *E. vilhenarum*, but Bernini & al. (1986) suppose that the state of cuticular structure is subject not only to individual variability but also to changes within the life span, depending on secretions by the cuticula. Therefore this character should not be overestimated. The number of sensillus branches on the sensillus may vary within a population (*E. africanus:* 8–9, *E. asiaticus:* 14–15, *E. becki:* 10–12, *E. crassisetiger:* 7–14, *E. gracilis* sensu Beck (1962): 8–10, *E. magnus:* 7–8, *E. parvus:* 9–13, *E.* cf. *parvus* sensu Bernini & al. (1986): 8–9, *E. salicifolius:* 9, *E.* (*N.*) *travei:* 6–8, E. *vermicularis:* 8, *E. vilhenarum:* 6–8). Some species (*E. asiaticus*, *E. becki*, *E. crassi-*

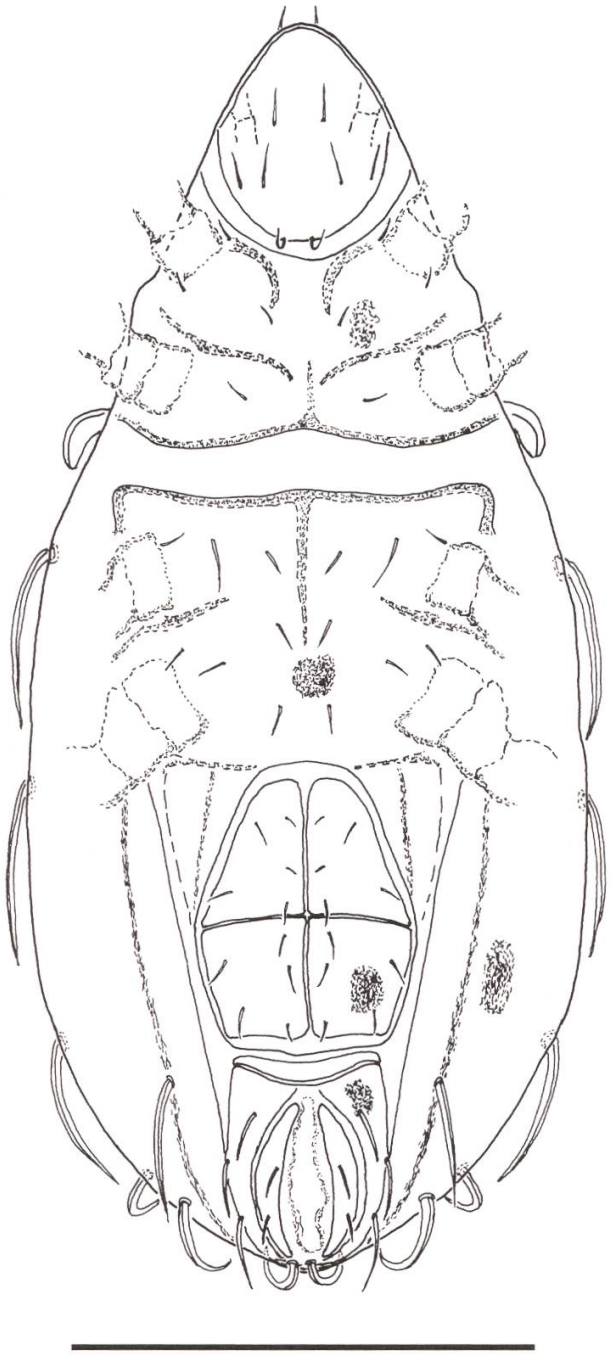

Fig. 4. ***Eohypochthonius benacensis*** **H. SCHATZ sp. nov., ventral view (Scale bar: 100 µm).**

setiger, *E. gracilis*, *E.* cf. *parvus* sensu Bernini & al. (1986), *E. salicifolius*, *E.* (*N.*) *travei*, *E. vermicularis*) show a row of very minute barbs on the opposite side of the sensillus stem which is not present in *E. benacensis* sp. nov. The notogastral setae are dilated in *E. asiaticus*, *E. crassisetiger*, *E. salicifolius*, *E. vilhenarum*. All setae on the legs are attenuating in *E. benacensis* sp. nov. without thickened setae *d* as is the case in *E. gracilis* and *E.* (*N.*) *travei*. No information on this character state is given in descriptions of other species.

Prior to the present study, only a single record of this genus in Italy was documented from near Bologna (Bernini & al. 1986) which is considered as *Eohypochthonius* cf. *parvus* (based on type studies of *E. parvus* AOKI, 1977 and *E. magnus* AOKI, 1977). This population differs from the new species by

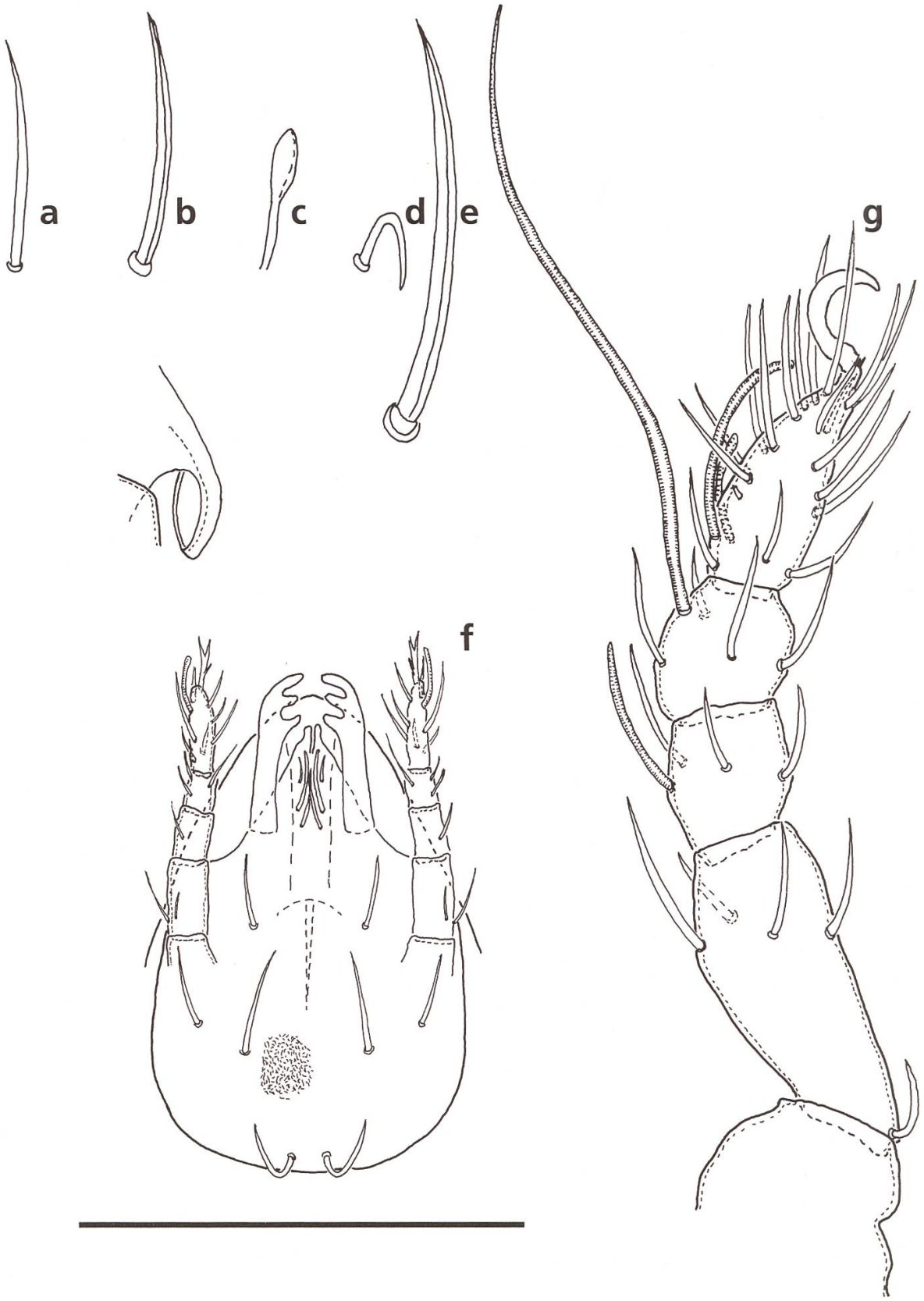

Fig. 5. ***Eohypochthonius benacensis*** **H. Schatz sp. nov., Details. – a: rostral seta; – b: lamellar seta; – c: interlamellar seta; – d: anterior exobothridial seta; – e: notogastral seta c_1; – f: subcapitulum; – g: leg I, abaxial aspect (Scale bar: 50 µm).**

the following character states: larger dimensions (290–315 x 110–130 µm), body shape more slender, cochlea-shaped tecta less evident, sensillus with 8–9 branches and small branches on the opposite side of the stem, lamellar and interlamellar setae attenuating, sometimes with barbs, notogastral setae shorter, ciliate, not broadened, not reaching insertions of next row, setae of rows *h* and *p* not bent, all epimeral setae of similar length. Both populations have a microsculpture.

Bernini & al. (1986) discuss possible reasons for the presence of this mite in Italy. If a passive dispersal occurred in the past (by natural means or by accidental human introduction), the species established itself in the new environment (as is demonstrated by repeated findings and the presence of immature instars of *E.* cf. *parvus*). On the other hand, the specimens were found in deeper soil layer, a barely investigated microhabitat, and could have a wider distribution (Bernini & al. 1986). A single specimen of *Eohypochthonius* cf. *parvus* was recently found in Spain at Cape Trafalgar near Cadiz (Subias & Gil-Martin 1995) on *Rhamnus alaternus*. It shows some minor differences to the species decribed by Aoki (1977). In later catalogues (Subias & Gil-Martin 1997, Subias 2008) this species is mentioned as *E. parvus* Aoki, 1977 without further explanations.

In accordance with Bernini & al. (1986), the presence of *E. benacensis* sp. nov. on the southern edge of the Alps might be explained by accidental human introduction. Several subtropical and tropical trees from different regions were planted on the island itself and around Lake Garda in the past. The soil between the roots might have contained this *Eohypochthonius* species from a remote area which survived in the new environment.

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