

Freshwater halacarid mites (Halacaridae: Prostigmata: Acari) from Tunisia, three new records and notes on geographical distribution of these species

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(with 3 figures)

Abstract

Samples from rivers in a mountain region of northwestern Tunisia contained the three freshwater halacarid species: *Lobohalacarus weberi* (Romijn & Viets, 1924), *Ropohalacarus uniscutatus* (Bartsch, 1982) and *Soldanellonyx monardi* Walter, 1919. *L. weberi* was the species most common. Records of the three species are summarized in maps which demonstrate the world-wide distribution of the species.

Keywords: Acari, freshwater Halacaridae, Tunisia, Ben Métir, new records, world distribution.

Introduction

Halacarid mites are small, benthic living animals, rarely exceeding a length of 600 μm . They are primarily marine though, world-wide, about 60 species occur regularly or exclusively in fresh water (versus more than 1,000 species in the sea). The first freshwater halacarid species have been described about a century ago from Europe, from Thuringia and Schleswig-Holstein, Germany, and the Gulbrandsdal, Norway (Kramer 1879, Lohmann 1893, Thor 1910). The Eurasian region is that with most records and highest number of genera and species (Bartsch 2007). The knowledge of the African halacarid fauna is poor. At present, the only record from north of the Sahara is that of *Porohalacarus hydrachnoides* (Lohmann, 1893), from a lake in the oasis El Golea, Sahara, Algeria (Walter 1935). That species most likely belongs to the wide-spread *Porohalacarus alpinus* (Thor, 1910).

Material

The samples with the mites are from the northwestern part of Tunisia, a well-wooded mountain area around the Ben Métir, altitude 400-750 m, with rainy winters and dry summers, in all an annual precipitation of more than 1000 mm (Berthélemy 1973). The Ben Métir is an artificial water reservoir in the river El Lil, the dam was build in 1954. The samples are from small wadis and rivers, 2 to 10 m

in width, which empty into the Ben Métir. The water mites had been collected by the late C. Berthélemy, University Toulouse, and forwarded to the late Dr. J. Schwoerbel. Dr. R. Gerecke, Tübingen, took care of the tubes and collecting data and forwarded the material to the author.

Voucher specimens are deposited in the Zoological Museum in Hamburg, Germany.

Unless stated otherwise, the information on geographical distribution is based on Viets (1956) and references given herein. More recent records are mentioned only if they significantly enlarge the known geographical range of a species, and publications summarizing data are given the priority to numerous single papers. Also included in the data set are records unpublished or in press. Taxonomic descriptions of the three species and notes on common congeners have been published recently by Bartsch (2006).

Results

In the samples from the northwestern Tunisia, three freshwater halacarid species were present, *Lobohalacarus weberi* (Romijn & Viets, 1924), *Ropohalacarus uniscutatus* (Bartsch, 1982) and *Soldanellonyx monardi* Walter, 1919. *Lobohalacarus weberi* was present in eight of the nine samples, *R. uniscutatus* and *S. monardi* in just one sample. According to the published and unpublished findings, the three species are spread world-wide and assumedly live on all continents and subcontinents.

Lobohalacarus weberi (Romijn & Viets, 1924)

COLLECTING DATA. One deutonymph, station 220, altitude 750 m, stream between Aïn Draham and Ben Métir, 1 km after turning to the dam Ben Métir, big pits rich in leaves, 14.12.1969. - 6 deutonymphs, 2 protonymphs, station 285, 4.8 km from the posts of the Col du Vent, inlet to the wadi El Lil, width 2-3 m, depth 60 cm (Chabet El Khantra), 12.02.1970. - 2 deutonymphs, station 290, altitude 450 m, wadi El Lebga, inlet to the dam Ben Métir, width 5 m, 13.02.1970. - 1 protonymph, station 345, altitude 450 m, wadi Ed Demene downstream (= O. Labgad), upstream the dam Ben Métir, width 8-10 m, 13.03.1970. - 1 deutonymph, Station 386, altitude 650 m, wadi Ed Demene, 1 km from the pass la Santé (between Aïn Draham and Fernana) upstream the dam Ben Métir, 20.03.1970. - 1 deutonymph, station 394, altitude 400 m, confluence of the wadis M'Koura and Delma, inlet wadi El Kébir, 2 km from Babouche towards la Calle (El Kala), 21.03.1970. - 2 females, 1 deutonymph, station 450, wadi Ed Demene downstream (= O. Labgad), upstream the dam Ben Métir, width 8-10 m, 19.04.1970. - 2 females, station 513, altitude 450 m, wadi Ed Demene downstream (= O. Labgad), upstream the dam Ben Métir, width 8-10 m, 07.06.1970. All coll. C. Berthélemy.

CHARACTERS (rare states in parentheses). Length of females 324-337 µm, of deutonymphs 280-335 µm and of protonymphs 209-284 µm. Female and nymphs with frontal spine. Dorsal plates faintly and uniformly pitted. In females all ventral plates fused to a shield. Genital sclerites with 3 pairs of genital acetabula. Area corresponding to GA with 4(-5) pairs of perigenital setae. Gnathosoma slender, distinctly longer than wide. Second palpal segment with 1 seta, 3rd segment with medial spine. Leg I longer than leg II. Genu and telofemur I similar in length. Genu I with 1 spine and 1 bristle, tibia I ventrally with 2 spines and 2 bristles. Tibiae II to IV ventrally with 2, 2(-1), 2 bipectinate setae and 1, 1, 1 smooth bristle,

respectively. Telfemora III and IV with 2/1, more rarely 2/0 dorsal/ventral setae. Tarsus I with large lateral fossa membrane. One of 3 ventral setae of tarsus I spur-like. Tarsi II to IV with 4/1, 4/1 and 3/1 dorsal/ventral setae, respectively.

REMARKS. *Lobohalacarus weberi* also includes the subspecies *L. weberi gotoensis* Imamura, 1970 and *L. weberi tristanensis* Bartsch, 1995, with records from Japan and Inaccessible Island, Tristan de Cunha Islands, respectively (Imamura 1970; Bartsch 1995a). The subspecies differ from the northern European form in slight differences in their combination of characters.

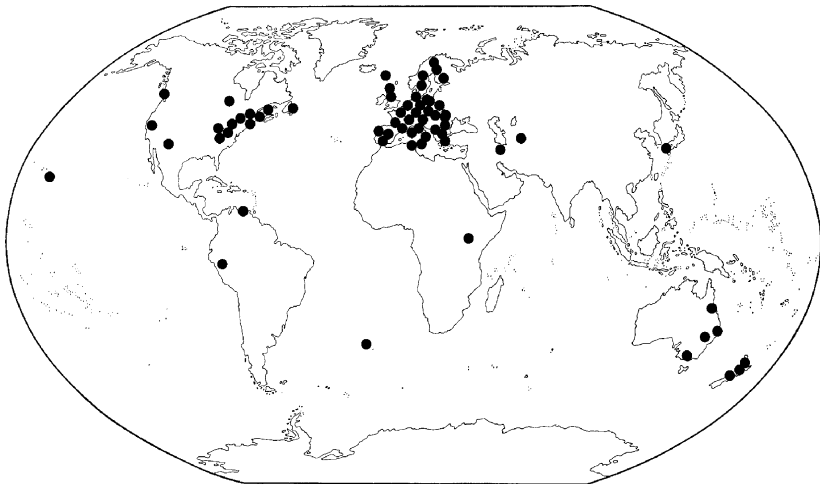
Another four species, *L. bunurong* Harvey, 1988, *L. hummelincki* Viets, 1940, *L. processifer* (Walter, 1919), and *L. bucharensis* Jankovskaja, 1967, are strikingly similar to *L. weberi*. *L. bunurong* was collected in Australia, Victoria, in the Thomson River (Harvey 1988). Its length is 399 μm , frontal spine included. Genu I bears a pair of spur-like ventral setae; tibiae II to IV 2, 1, 2 pectinate setae, respectively (Harvey 1988). The record of *L. hummelincki* is from the northeastern coast of Venezuela, from the Rio Chuspa near Higuerote (Viets 1940a). The length of that species is 324 μm (frontal spine included). The genital sclerites bear 1 and 2 genital acetabula, genu I a pair of spur-like setae, the ventromedial seta is slightly more slender than the ventral seta. Basifemur III has 2/0 dorsal/ventral setae, tibiae II to IV bear 2 pectinate + 1 smooth, 1 pectinate + 1 smooth, and 2 pectinate + 1 smooth ventral setae, tarsi III and IV 4/1 and 3/0 dorsal/ventral setae, respectively (Viets 1940a). *L. processifer*, from the Lake Lavandera in Peru, altitude 5140 m, is known by a single protonymph. The length is 290 μm (Walter 1919). Number and shape of the setae on the legs of adults is not known. *L. bucharensis* was described on the basis of a deutonymph, protonymph and larva from the southwestern part of the Kizylkum desert, Uzbekistan, near Buchara (Jankovskaja 1967). The deutonymph (holotype) differs from nymphs of *L. weberi* in that its telfemur I bears a pair of short, spiniform setae (Jankovskaja 1967: fig. 1.6) and the tines on the claws of tarsus II are unusually long. Telfemur I of *L. weberi* has no such spiniform setae.

Several morphological characters are known to vary from population to population as also within given populations of *L. weberi* (Bartsch 1995a, in press), e.g., the number and shape of setae on the legs, number of setae around the GO and number of genital acetabula on the genital sclerites. The combination of the characters in *L. bunurong*, *L. hummelincki* and *L. processifer* is expected to lie within the range common in *L. weberi*, and the three species to belong to the *Lobohalacarus weberi* complex. The taxonomic position of *L. bucharensis* is unclear, though, most likely, that species is a member of the *L. weberi* complex, too.

At present, *L. subterraneus* Bartsch, 1995 is the only *Lobohalacarus* species distinct from species of the *L. weberi* complex (Bartsch 1995b). Another two species, *L. dolgarae* Green, 1954 and *L. gallicus* (Migot, 1926), once attributed to *Lobohalacarus*, are now expected to belong to the genus *Porohalacarus* (Bartsch 2006).

GEOGRAPHICAL DISTRIBUTION (of *L. weberi* and the *L. weberi* complex) (Fig. 1).

Europe (from west to east and south to north): - Portugal, River Zézere, District Castelo Branco; River Mondega, District Coimbra; River Doura, District Porto; River Ave, District Porto; River Cavado, District Braga; River Lima, District Viano do Castelo (unpublished records). - Spain, river Huelva, Province Sevilla; Despenaperros swamp, Province Jaen; River Almonte, Province Cáceres; Cave El Torón, Province Toledo; River Tajo, Province Guadalajara; River Cabrillas, Province Guadalajara; River Moros, Province Segovia (unpublished records). - France, Corsica and the mainland from the Pyrenées to the river Moselle (Angelier 1965). - Belgium. - The Netherlands (Bartsch & Smit 2006). - British Isles, northern England and Scotland (Green & MacQuitty 1987); according to Gledhill & Viets (1976) also present on Ireland. - Italy, Islands Sardinia and Sicily and the mainland from the south to the north (Viets 1939; Teschner 1988; Mari & Morselli 1992; Di Sabatoni & Cicolani 1999). - Switzerland. - Austria, Danube (Bartsch & Panesar 2000). - Germany, from the south-west to the north and north-east, from southern part of Schwarzwald (Black Forest) (Schwoerbel 1955, 1956) to Schleswig-Holstein (Bartsch 1981) and the Island Rügen (November 1990, coll. I. Bartsch, unpublished record). - Denmark, Faeroer (Hvalstation, 12 April 1981, coll. R.M. Kristensen, unpublished record). - Sweden, from the southern to northern part (Bartsch 1989b), also common in brackish coastal water, e.g., the Archipelago of Luleå, Bothnian Bay. - Finland, southern part (Paasivirta 1975). - Greece, Island Euboea, Biological Station Keramou (Travé 1972). - Macedonia (Viets 1956). - Monte Negro, Bjelasica Mountains (Pescic 2004). - Hungary, widespread (Szalay 1970). - Poland, southern part



***Lobohalacarus weberi* complex**

Fig. 1. Geographical distribution of *Lobohalacarus weberi* (Romijn & Viets) and species of the *Lobohalacarus weberi* complex.

(Biesiadka 1975, 1979). - Bulgaria, Slatica-Pirdop Basin (Petrova et al. 1991). - Romania, northwestern part (Konnerth-Ionescu 1981).

Africa: - Tunisia, above mentioned record. - Kenya, Rift Valley, Narasha Lake, 2950 m and Cherangani, 3300 m (Walter & Bader 1952). - Tristan da Cunha Islands, Island Inaccessible (*L. weberi tristanensis*) (Bartsch 1995a).

Asia: - Iran, Tehran Province, Elburs Mt., Shahrestanak River (Pesic et al. 2006). - Uzbekistan, southwestern part of the Kizylkum desert — *Lobohalacarus bucharensis* (Jankovskaja 1967, 1972). - Japan, Goto Islands, Island Fukué-jima — *L. weberi gotoensis* (Imamura 1970).

Australia: - Queensland, amongst sediment of a tidal mangrove mud flat and debris in a nearshore freshwater swamp area on North Stratford Island (Adams Beach) off Brisbane (February 2004, Bartsch in press). - Victoria, a record of *Lobohalacarus bunurong* (Harvey 1988). - Further records of the genus *Lobohalacarus* are from New South Wales and northern Queensland (Proctor 2001; Boulton & Harvey 2003; Boulton et al. 2004); the author expects these specimens to belong to the *L. weberi* complex.

New Zealand: - North and South Island (Bartsch 2007).

Pacific Islands: - Hawaiian Islands, Oahu Island (Imamura 1981).

North America (from west to east and south to north): - USA, California, Arizona, New Mexico, Colorado, Georgia, Tennessee, North Carolina, Illinois, Virginia, New York, Rhode Island, New Hampshire (Bartsch 1982; Pennak & Ward 1986; Strayer 1985, 1988; unpublished data from California, Arizona, New Mexico, Georgia, Tennessee, North Carolina, Illinois, and Virginia collected 1976 - 1992 by I. M. Smith, Ottawa, and his colleagues). - Canada, British Columbia, Ontario, New Brunswick, Quebec, Newfoundland (unpublished data collected 1975 - 1989 by I. M. Smith, Ottawa, and his colleagues).

South America: - Peru, Lake Lavandera — *Lobohalacarus processifer* (Walter 1919). - Venezuela, northeastern coast near Higuero — *Lobohalacarus hummelincki* (Viets 1940a).

ECOLOGY. Regularly present in surface and subsurface substrata. One of the most common species in hypogean and hyporheic sandy deposits and in water works, as also amongst surface debris in lakes and in mosses growing in limno- and helocrenes and at the banks of rivers. Inhabitant of coastal brackish water sediment (together with marine forms), but present also in humic bogs. Records are from the sea level to altitudes of 5140 m.

Ropohalacarus uniscutatus (Bartsch, 1982)

COLLECTING DATA. One female, station 215, wadi El Lebga, inlet to the dam Ben Métir, 14.12.1969; coll. C. Berthélemy.

CHARACTERS. Length of idiosoma 274 µm, width 155 µm. Dorsal plates AD and PD fused; OC reduced. All ventral plates fused. Genital sclerites with 3 pairs of acetabula; area corresponding to genital plate with 3 pairs of perigenital setae. Gnathosoma short, slightly wider than long. Second

palpal segment with two setae, third segment with medial spine. Legs I and II similar in length. Genua I and II shorter than telofemora. Tibiae I and II with 3, tibiae III and IV with 2 slightly bipectinate ventral bristles, respectively. Tibiae I and II each with 2 spiniform dorsal setae. Claws of all tarsi similar in shape, slender with few tines near the arc.

GEOGRAPHICAL DISTRIBUTION (Fig. 2).

Europe: - Northern Germany, small helocrene area north of Hamburg (Bartsch 1989a).

Africa: - Tunisia. First record from Africa.

Australia: - Queensland, in a small nearshore freshwater pond on North Stratford Island (Adams Beach) off Brisbane (February 2004, coll. I. Bartsch, unpublished).

North America: - Rhode Island and New York (Bartsch 1982, Strayer 1988).

ECOLOGY. Records are from subterranean waters or epigeal sites fed by springs, though the holotype is from a marine site, from the brown algae *Ascophyllum nodosum* (L.) Le Jolis, Rhode Island, USA. The records from Europe are at present restricted to a helocrene bog near Hamburg. In this bog the distribution of *R. uniscutatus* was very patchy, the mites only found within areas where spring water reached the surface, but absent in samples from nearby mosses.



Ropohalacarus uniscutatus

Fig. 2. Geographical distribution of *Ropohalacarus uniscutatus* (Bartsch).

Soldanellonyx monardi Walter, 1919

COLLECTING DATA. One female, station 290, altitude 450 m, wadi El Lebga, inlet to the dam Ben Métir, width 5 m, 13.02.1970; coll. C. Berthélemy.

CHARACTERS. Length of female 328 μm . Anterior margin of idiosoma truncate. Dorsal plates with faint reticulation. Ocular plates with small spots of light-brown eye pigment. Genital plate with 5 pairs of genital acetabula. Subgenital setae lacking. Gnathosoma short, about as wide as long. Second palpal segment with small basal and long apical seta; third segment with large ventral spine. Legs I and II similar in shape. Genua I and II shorter than telofemora. Telofemora short, their length less than twice the height. Tibiae I to IV each with pair of ventral bristle-like setae. Tibiae I and II with 1 and 2 spiniform dorsomedial setae, respectively. Claws on tarsus I with its tines in umbrella-like arrangement; tines on following claws arranged along shaft of claw.

GEOGRAPHICAL DISTRIBUTION (of *S. monardi* and its subspecies) (Fig. 3).

Europe (from west to east and south to north): - Portugal, River Zézere, District Castelo Branco; river Cavado, District Braga (unpublished records). - Spain, Las Hurdes, Province Cáceres; river Tajo, Province Guadalajara; river Arlanza, south of Burgos, Province Burgos; cave El Toyu, Province Santander; San Sebastian, Province Guipúzcoa (Viets 1937; unpublished data). - France, from the Pyrenées to close to Nancy (Angelier 1965). - Belgium. - The Netherlands (Bartsch & Smit 2006). - British Isles, southern and northern England, Wales, southern Scotland (Green & MacQuitty 1987); according to Gledhill & Viets (1976) also present on Ireland. - Italy, from the south to the north and the island Sicily (Viets 1939; Teschner 1988; Mari & Morselli 1992; Di Sabatoni & Cicolani 1999). - Switzerland. - Austria. - Germany, from the south-west to the north and north-east, namely from the southern part of the Schwarzwald (Black Forest) (Schwoerbel 1955, 1956) to Schleswig-Holstein (Bartsch 1981) and the Island Rügen (November 1990; coll. I. Bartsch, unpublished). - Denmark, mainland (Hallas 1978) and Faeroes (Hvalstation, April 1981; coll. R.M. Kristensen, unpublished). - Sweden, records from the southern to the northern part (Bartsch 1989b); also present in the brackish coastal water, e.g. the Archipelago of Luleå, Bothnian Bay. - Finland, southern and northern part of Finland (Viets 1940b; Paasivirta 1975). - Macedonia (Viets 1956). - Monte Negro, Bjelasica Mountains (Pescic 2004). - Hungary, Dunazug mountains (Szalay 1970). - Bulgaria, southwestern part (Petrova 1975). - Romania, northwestern part (Konnerth-Ionescu 1981). - Ukraine, Crimea, Sevastopol (Bartsch 2004). - Russia, Republic of Karelia and Murmansk (Kola Peninsula) (Sokolov 1952; Jankovskaja 1965, 1975).

Africa: - Tunisia, above mentioned record. - Kenya, close to Elgon, 3500 m and Kinangop, 2600 m (Walter & Bader 1952).

Asia: - Java, near Sarangan (*S. m. saranganensis*). - Japan, Hyogo, west of Himéji City (*S. m. hyogoensis* Imamura, 1981) and lava caves west and south-west of Fuji-san (*S. m. japonicus* Imamura, 1971) (Imamura 1957, 1971, 1981).

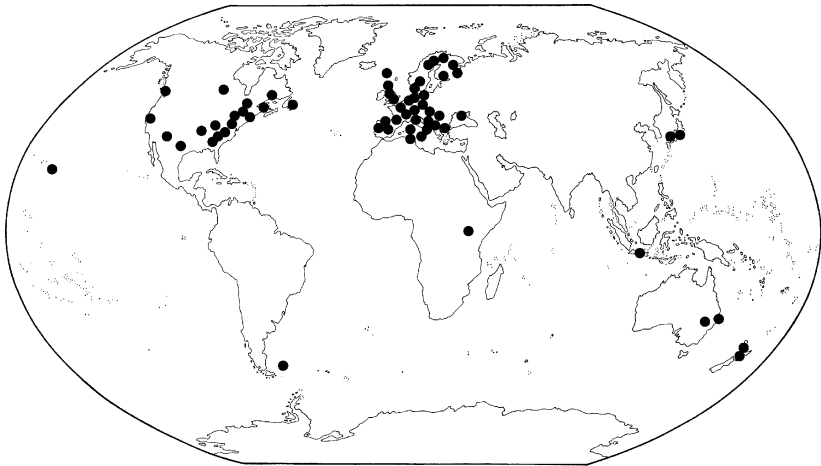
Australia: - New South Wales (Boulton & Harvey 2003; Boulton et al. 2004). - Queensland, from small nearshore freshwater pond on North Stratford Island (Adams Beach) off Brisbane (February 2004: Bartsch, in press).

New Zealand: - North Island (Bartsch 2007).

Pacific Islands: - Hawaiian Islands, Oahu Island (Imamura 1981).

North America (from west to east and south to north): - USA, California, Oregon, Arizona, Texas, Alabama, Georgia, Tennessee, North Carolina, Missouri, Indiana, Virginia, Pennsylvania, New York, Rhode Island, New Hampshire (Walter 1931; Bartsch 1982; Strayer 1985, 1988; unpublished data from California, Oregon, Arizona, Alabama, Georgia, Tennessee, North Carolina, Missouri, Virginia, and Pennsylvania collected 1976-1992 by I. M. Smith, Ottawa, and his colleagues, and from Texas, Honey Creek Cave, Comal County, September 1990, collected by T. Iliffe). - Canada, British Columbia, Manitoba, Ontario, New Brunswick, Quebec, Newfoundland (unpublished data, collected 1974-1988 by I. M. Smith, Ottawa, and his colleagues).

South America: - Falkland Islands (Pugh & Dartnall 1994).



Soldanellonyx monardi

Fig. 3. Geographical distribution of *Soldanellonyx monardi* Walter.

ECOLOGY. Commonly found in a variety of habitats, amongst sediment, mud, mosses, vascular plants and aufwuchs. Present in surface and subsurface habitats, in coastal brackish water as well as in humic bogs, in lowlands and on mountains.

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Zusammenfassung

Proben genommen im Bergland Nordtunesiens, in der Umgebung des Ben Mêtir Stausees, enthielten die drei Halacariden-Arten *Lobohalacarus weberi* (Romijn & Viets, 1924), *Ropohalacarus uniscutatus* (Bartsch, 1982) und *Soldanellonyx monardi* Walter, 1919. *Lobohalacarus weberi* war die am weitest verbreitete Art. Bisher bekannt gewordene Fundorte dieser Arten sind in Karten zusammengestellt worden. Wie die Karten zeigen, gehören die drei Arten in die Gruppe der Süßwasserhalacariden, die weltweit verbreitet sind.

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