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## Research note

# New records of Mexican Tardigrada

## Nuevos registros de Tardigrada mexicanos

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**Abstract.** In 9 moss samples collected from Mexico, 6 tardigrade species, including 4 new records for the country, were found. The new records raise the number of known Mexican water bear species to forty-one. We provide a full list of the known Mexican tardigrade species and discuss some biogeographical and taxonomic issues.

Key words: Eutardigrada, Heterotardigrada, fauna.

**Resumen.** En 9 muestras de musgo recolectadas en México, se encontraron 6 especies de tardígrados, incluyendo 4 nuevos registros para el país. Los nuevos registros incrementaron a 41 el número de especies de tardígrados mexicanos conocidos. Se proporciona una lista completa de tardígrados mexicanos conocidos y se discuten algunas cuestiones biogeográficas y taxonómicas.

Palabras clave: Eutardigrada, Heterotardigrada, fauna.

The tardigrade fauna of Mexico has been studied occasionally and in consequence it is very poorly known. To date 37 tardigrade species have been reported from only 8 of the 31 Mexican states, and 7 papers have been published on tardigrade fauna of Mexico: Heinis (1911), May (1948), Schuster (1971), Beasley (1972), Claps and Rossi (2002), Pilato and Lisi (2006), and Beasley et al. (2008). In this paper we provide a full list of tardigrade species previously reported from Mexico and include 4 new records found during this study. Additionally, some biogeographical and taxonomical remarks are provided on the species reported from the country.

Nine moss samples were collected by the second author from Campeche, Chiapas, Mexico and Oaxaca states in the southern part of Mexico (North and Central America). Tardigrades and/or their eggs were found only in 3 samples (see the list below). All specimens were mounted on microscopic slides in Hoyer's medium. Observations and photomicrographs were taken using Phase Contrast Microscopy (PCM). Species were determined mainly on the basis of the key to the World Tardigrada (Ramazzotti and Maucci, 1983) and original descriptions.

The list of localities from which positive samples were collected is as follows. 1, Chiapas State, San Juan Chamula, mosses from soil, 29.10.2007: 24 specimens + 5 eggs. 2, Chiapas State, Palenque, mosses from stone, 15.10.2007: 48 specimens + 10 eggs. 3, Oaxaca State, Monte Alban, ancient ruins of the Zapoteca culture, mosses from soil, 10.10.2007: 56 specimens + 3 eggs.

(\*new record for Mexico)

*Echiniscus viridissimus* Péterfi, 1956\*

*Material examined in this study:* 19 specimens.

*Locality.* 3.

*Remarks.* New species report for Mexico. Up to now it has been recorded only from Europe, and South and North America (McInnes, 1994).

*Milnesium cf. tardigradum tardigradum* Doyère, 1840

*Material examined in this study:* 3 specimens.

*Locality.* 2.

*Remarks.* Cosmopolitan species, recorded from many localities throughout the world; however, older reports should be verified given recent descriptions of many new species within the genus (Tumanov, 2006).

*Macrobiotus alvaroi* Pilato and Kaczmarek, 2007\*

*Material examined in this study:* 35 specimens and 8 eggs.

*Locality.* 2.

*Remarks.* This is the second report of this species and also the first report outside the type locality (Costa Rica) (Pilato and Kaczmarek, 2007).

*Macrobiotus coronatus* de Barros, 1942

*Material examined in this study:* 37 specimens and 3 eggs.

*Locality.* 3.

*Remarks.* Species recorded from many localities in Europe, Asia, New Zealand, North, Central and South America and Antarctica (McInnes, 1994). According to Pilato et al. (2000), the only confirmed localities are in South America. This is the first confirmed record of this species in Central America.

*Macrobiotus persimilis* Binda and Pilato, 1972\*

*Material examined in this study:* 24 specimens and 5 eggs.

*Locality.* 1.

*Remarks.* New species for Mexico. Up to now this species was known only from southern Europe, northern Africa, Australia and Greenland (McInnes, 1994).

*Macrobiotus terminalis* Bertolani and Rebecchi, 1993\*

*Material examined in this study:* 10 specimens and 2 eggs.

*Locality.* 3

*Remarks.* New species for Mexico. Up to now this species was known only from southern Europe (Bertolani and Rebecchi, 1993).

This paper adds 4 new records to a short list of known Mexican tardigrade species (41 species). All these species were reported from only 8 Mexican states whereas in other 23 states data are lacking (Table 1). Moreover, nearly half (16) of the known species are considered cosmopolitan, which means that these records are doubtful and need to be confirmed.

Interestingly, 5 species were reported only once from their type localities. The remaining species are known from a range of biogeographical regions: Neotropical (10 species), Nearctic (6), Palearctic (6), Holarctic (3), Afrotropical and Australian (1). A large proportion of Neotropical species suggests a major influence of this region on the tardigrade fauna of Mexico, and the presence of species from the Palearctic, Nearctic and Neotropical regions indicates that Mexico is situated on the border of 2 large biogeographical regions, the Nearctic and Neotropical. Nevertheless, the low number of known Mexican tardigrade species currently prevents any biogeographical analysis.

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**Table 1.** A list of all known Mexican tardigrade species with their localities (states) and biogeographic and taxonomic comments

Species	States	Source	Remarks
<i>Cornechiniscus lobatus</i> (Ramazzotti, 1943)	Sinaloa	4	Recorded from the Holarctic realm
<i>Diphascon</i> ( <i>Diphascon</i> ) <i>chilenense</i> Plate, 1888**	Chihuahua	3	Cosmopolitan
<i>D. (D.) nodulosum</i> (Ramazzotti, 1957)	Mexico	4	Recorded from the Nearctic region and New Zealand
<i>Doryphoribius evelinae</i> (Marcus, 1928)	Chihuahua	3	Recorded from the Holarctic realm and the Neotropical region
<i>D. flavus</i> (Iharos, 1966)	Chiapas	6	Recorded from the Palearctic and Neotropical regions
<i>D. gibber</i> Beasley and Pilato, 1987	Chiapas	6	Nearctic species
<i>D. mexicanus</i> Beasley, Kaczmarek and Michalczyk, 2008	Oaxaca	7	Recorded only from the type locality
<i>Echiniscus kerguelensis</i> Richters, 1904	Mexico and Morelos	4	Cosmopolitan species (excluding South America and Asia)
<i>E. kofordi</i> Schuster and Grigarick, 1966	Chiapas	6	Recorded from the Neotropical and Nearctic regions
<i>E. siegristi</i> Heinis, 1911	Oaxaca	1	Recorded only from the type locality
<i>E. tamus</i> Mehlen, 1969	Chihuahua	3	Nearctic species
<i>E. viridis</i> Murray, 1910	Chihuahua	3	Recorded from the Holarctic realm and the Neotropical region (Pilato et al. 2007 and 2008)
<i>E. viridissimus</i> Péterfi, 1956	Oaxaca	8	Recorded from the Holarctic realm and the Neotropical region (Pilato et al. 2007 and 2008)
<i>Haplomacrobiotus hermosillensis</i> May, 1948	Sonora	2	Nearctic species
<i>Hypsibius convergens</i> (Urbanowicz, 1925)**	Chihuahua	3	Cosmopolitan

Table 1. Continues

Species	States	Source	Remarks
<i>H. pallidus</i> Thulin, 1911**	?	5	Cosmopolitan
<i>Isohypsibius sattleri</i> (Richters, 1902)	Chiapas	6	Cosmopolitan
<i>I. sculptus</i> (Ramazzotti, 1962)	Morelos	4	Recorded from the Palearctic and Neotropical regions
<i>Itaquascon umbellinae</i> de Barros, 1939	Chihuahua	3	Recorded from the Palearctic and Neotropical regions, and New Zealand
<i>Macrobiotus alvaroi</i> Pilato and Kaczmarek, 2007	Chiapas	8	This is the only record apart from the type locality in Costa Rica
<i>M. ascensionis</i> Richters, 1908	?	5	Recorded from Caucasus
<i>M. contii</i> Pilato and Lisi, 2006	Chiapas	6	Recorded only from the type locality
<i>M. coronatus</i> de Barros, 1942	Chihuahua and Oaxaca	3, 8	Cosmopolitan
<i>M. echinogenitus</i> Richters, 1904**	Mexico	4	Cosmopolitan. A doubtful record based on a single specimen (without eggs)
<i>M. h. harmsworthi</i> Murray, 1907**	Sinaloa and Oaxaca	1, 4	Cosmopolitan
<i>M. h. hufelandi</i> C.A.S. Schultze, 1833**	Chihuahua, Mexico, and Oaxaca	1, 3, 4	Cosmopolitan
<i>M. persimilis</i> Binda and Pilato, 1972	Chiapas	8	Palearctic species, but also known from Australia
<i>M. rubens</i> Murray, 1907	Oaxaca	1	Recorded from the Neotropical, Afrotropical, Australian and Palearctic regions
<i>M. terminalis</i> Bertolani and Rebecchi, 1993	Chiapas	8	Up to now recorded only from the Palearctic region
<i>Milnesium t. tardigradum</i> Doyère, 1840**	Chihuahua, Mexico, Morelos	3, 4, 8	Cosmopolitan
<i>Minibiotus continuus</i> Pilato and Lisi, 2006	Chiapas	6	Recorded only from the type locality
<i>M. furcatus</i> (Ehrenberg, 1859)	Mexico and Morelos	4	Cosmopolitan
<i>M. intermedius</i> (Plate, 1888)**	Chihuahua	3	Cosmopolitan
<i>Paramacrobiotus areolatus</i> (Murray, 1907)**	Chihuahua	3	Cosmopolitan
<i>P. richtersi</i> (Murray, 1911)**	Chihuahua	3	Cosmopolitan
<i>Pseudechiniscus facettalis</i> Petersen, 1951	Chihuahua	3	Cosmopolitan species (excluding Asia)
<i>P. gullii</i> Pilato and Lisi, 2006	Chiapas	6	Recorded only from the type locality
<i>P. juanita</i> de Barros, 1939	Chiapas	6	Recorded from the Palearctic and Neotropical regions
<i>P. suillus</i> (Ehrenberg, 1853)	Oaxaca	1	Cosmopolitan
<i>Ramazzottius baumanni</i> (Ramazzotti, 1962)	Mexico, Michoacán, Morelos	4	Recorded from the Nearctic and Neotropical regions, and New Zealand
<i>Ramazzottius oberhaeuseri</i> (Doyère, 1840)**	Mexico and Michoacán	4	Cosmopolitan

1, Heinis (1911); 2, May (1948); 3, Schuster (1971); 4, Beasley (1972); 5, Ramazzotti and Maucci (1983); 6, Pilato and Lisi (2006); 7, Beasley, Kaczmarek and Michalczyk (2008), 8, current study. \*\*Doubtful species, now considered as groups of very similar taxa (i.e. all older reports should be confirmed).

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