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DIVERSITY AND DISTRIBUTION OF TARDIGRADES (BILATERIA, TARDIGRADA) FROM THE IBERIAN PENINSULA, BALEARIC ISLANDS AND CHAFARINAS ISLANDS

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ABSTRACT

Bibliographical information on the Tardigrada from Iberian Peninsula, Balearic Islands and Chafarinas Islands is compiled herein. 118 species are listed from the studied area. The first records of six Tardigrada species, *Dactylobiotus parthenogeneticus*, *Dactylobiotus selenicus*, *Murrayon dianeae*, *Diphascon (Diphascon) nodulosum* (first time in Europe), *Diphascon (Diphascon) pingue* and *Isohypsibius marcellinoi* that had not previously been found in the area are included. Bibliography data are analysed. After the analysis, it is concluded that more intensive, extensive and within more diverse habitats sampling effort should significantly increase the knowledge of tardigrade diversity in the studied area.

Keywords: Tardigrada, corology, Iberian Peninsula, Balearic Islands, Chafarinas Islands, new records, Apochela, Parachela, Arthrotardigrada, Milnesiidae, Calohypsibiidae, Hypsbiidae, Batillipedidae, Echiniscidae, Echiniscoididae.

RESUMEN

Diversidad y distribución de las especies del *phylum* Tardigrada en la Península Ibérica, Islas Baleares e Islas Chafarinas

En este artículo hemos recopilado la información existente en la bibliografía acerca del *phylum* Tardigrada en la Península Ibérica, Islas Baleares e Islas Chafarinas. La lista de especies del phylum Tardigrada incluye 118 especies en el área de estudio. Además, incluimos seis especies encontradas por primera vez en el área de estudio: *Dactylobiotus parthenogeneticus*, *Dactylobiotus selenicus*, *Murrayon dianeae*, *Diphascon (Diphascon) nodulosum* (por primera vez encontrado en Europa), *Diphascon (Diphascon) pingue* e *Isohypsibius marcellinoi*. En base al análisis realizado con los datos recopilados de la bibliografía, podemos concluir que un pequeño aumento en el esfuerzo de muestreo (intensivo, extensivo y aumentando la diversidad de hábitats recolectados) se traduce en un aumento significativo de la diversidad del *phylum* en el área estudiada.

Palabras clave: Tardigrada, corología, Península Ibérica, Islas Baleares, Islas Chafarinas, nuevas citas, Apochela, Parachela, Arthrotardigrada, Milnesiidae, Calohypsibiidae, Hypsbiidae, Batillipedidae, Echiniscidae, Echiniscoididae.

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Introduction

Tardigrades are micrometazoans that can be found world-wide (McInnes, 1994; Nelson & Marley, 2000), in many types of habitats (aquatic and terrestrial) within a film of water (Ramazzotti & Maucci, 1983; Nelson, 1995). They are specially interesting for their capacity to enter in criptobiosis (Crowe, 1975; Nelson, 1995), with posible future applications in biomedicine (Crowe & Crowe, 2000). Another important point is that the phylogenetic position of the Tardigrada gives rise to controversy, depending on whether morphological characters (Nelson, 1982; Nielsen, 1995) or molecular characters (Garey *et al.*, 1996; Giribet *et al.*, 1996; Garey *et al.*, 1999) are studied. Nowadays, it seems that preserving genetic dissimilarity, based on phylogenetic information, is often of a higher conservation priority (Humphries *et al.*, 1995; Hartvingsen, 2001; Swingland, 2001). Although conservation based on ecosystem and landscape approaches might be better, a single-species approach may still be appropriate as a first order conservation tool (Kieser, 1993). Therefore, we need the studied group's complete taxonomical information, up-to-date check lists, species diversity studies, relative abundances, corology, etc. to define the phylogeny robustly and, from that, to infer its biodiversity. All of this information, and even more basic information, are incomplete in the Tardigrada *phylum*.

Tardigrade species description, as it is the case with many other invertebrate groups, accelerated during XX century, along with the growth in the number of researchers involved in its investigation. Tardigrade researches in Iberian Peninsula began in 1911 (Madrid Moreno, 1911), 138 years after the discovery of Tardigrada *phylum* in 1773 (Goeze, 1773). In the Iberian Peninsula, tardigrade studies are mainly one-off descriptions of new taxa, while in other countries tardigrade researchers work other than with the description of new taxa, with the biology and the ecology of the group.

The main objective of the present work is to compile and up-date the entire body of tardigrade information (species diversity, corology, autecology) for the Iberian Peninsula, the Balearic Islands and Chafarinas Islands, and to show how a small sampling effort (in many types of habitats) could greatly advance the knowledge of Iberian tardigrades, as one may infer from the bibliographic data.

Material and Methods

This work is based on taxonomic and geographic distribution information found in 34 scientific articles (Table I) on tardigrade species found in the Iberian Peninsula, the Balearic Islands and Chafarinas Islands (first article related with the area is Heinis, 1908, on Canary Island tardigrades), dated from 1911 (plankton from ponds in Madrid and

Table I.— List of all the articles dealing with tardigrade information that have been published for Iberian Peninsula, Balearic Islands and Chafarinas Islands chronologically ordered. *1= Paper of Heinis, 1908 is not about Iberian Peninsula Tardigrada fauna, it is from Canarian Islands, but it is the first paper related to the area, *2= articles that deal with marine tardigrades from studied area.

Tabla I.— Lista de los artículos sobre los tardígrados en la Península Ibérica, Islas Baleares e Islas Chafarinas. *1= El artículo de Heinis, 1908, no es sobre los tardígrados de la Península Ibérica, es sobre los tardígrados de las Islas Canarias, pero es el primer artículo relacionado con el área a estudio, *2= artículos sobre los tardígrados marinos del área a estudio.

ARTICLES		
Heinis, 1908*1	Rodríguez Roda, 1947*2	Maucci, 1983
Madrid Moreno, 1911	Da Cunha, 1948	Ramazzotti & Maucci, 1983
Pardo García, 1919	Rodríguez Roda, 1949	Lewin Osorio, 1984
Pardo García, 1921	Rodríguez Roda, 1951	Maucci & Durante Pasa, 1984
Barros & Da Cunha, 1937	Rodríguez Roda, 1952	Maucci & Durante Pasa, 1985
Da Cunha, 1941	Mihelcic, 1954	Maucci, 1991
Da Cunha, 1943	Mihelcic, 1955	McInnes, 1991
Da Cunha, 1944 a	Maucci, 1979	Villora Moreno, 1993*2
Da Cunha, 1944 b	Kristensen & Hallas, 1980*2	Villora Moreno & De Zio Grimaldi, 1993*2
Rodríguez Roda, 1946	Fontoura, 1981	De Zio Grimaldi & Villora Moreno, 1996*2
Da Cunha, 1947 a	Maucci & Ramazzotti, 1981	Villora Moreno & De Zio Grimaldi, 1996*2
Da Cunha, 1947 b	Fontoura, 1982	

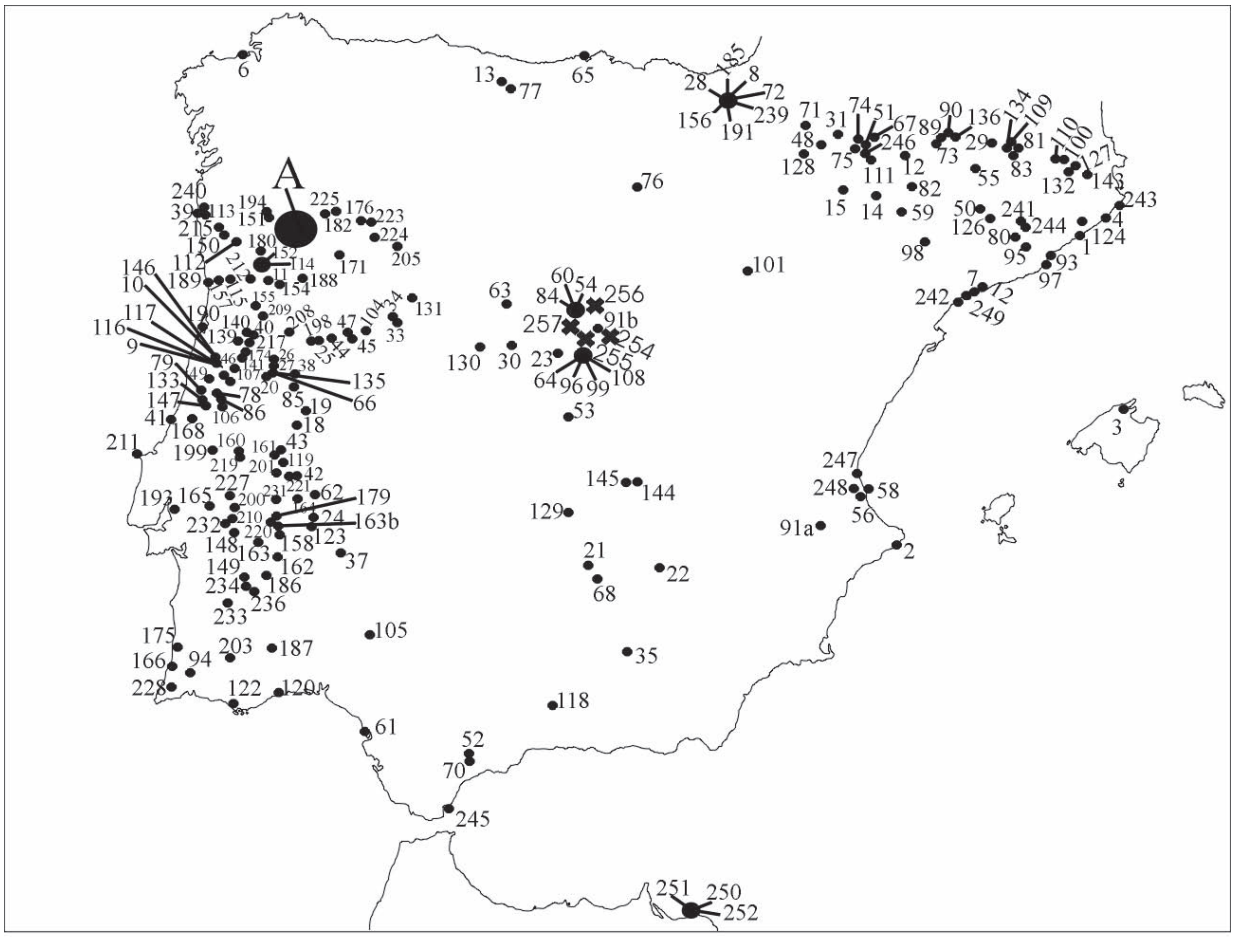

Fig. 1.— Localities sampled in the Iberian Peninsula, the Balearic Islands and Chafarinas Islands, where tardigrades have been found. Identification number corresponding to localities in Table III. "X" marks new localities where have been found new tardigrade records for the Iberian Peninsula, the Balearic Islands and Chafarinas Islands. Region "A" includes next localities: 120b, 137, 138, 153,159, 169, 170, 172, 173, 177, 183, 184, 196, 206, 207, 213, 216, 222, 237.

Fig. 1.— Localidades muestreadas en la Península Ibérica, Islas Baleares e Islas Chafarinas, donde se han encontrado tardígrados. El número de identificación de las localidades se corresponde con el de la Tabla III. Hemos marcado con una "X" las nuevas localidades de la Península Ibérica, Islas Baleares e Islas Chafarinas donde hemos encontrado tardígrados. La región "A" incluye las siguientes localidades: 120b, 137, 138, 153,159, 169, 170, 172, 173, 177, 183, 184, 196, 206, 207, 213, 216, 222, 237.

Valencia; Madrid Moreno, 1911) to 1996 (Villora Moreno & De Zio Grimaldi, 1996), a zoogeographic study of marine tardigrades from the Chafarinas Islands (Mediterranean Sea, off North Africa).

These data are completed with information from new material collected by Dr. A. I. Camacho from groundwater (interstitial environments and caves) from Cantabria, Jaén and Madrid (North, South and Centre of Spain), and from stratified sampling (by the author) of leaf-litter, rock mosses, trunk lichens and mosses, and freshwater algae from different points in the province of Madrid (centre of Spain). In addition to the customary habitats (with respect to Tardigrada *phylum*) such as leaf-litter, mosses, and lichens from different substratums as: trunks and rocks; we also sampled such unusual habitats as interstitial ones associated with epigean streams or freshwaters algae, and habitats not previously sampled in the Iberian Peninsula (with respect to Tardigrada *phylum*), like interstitial habitats associated with subterranean rivers or gours in caves.

Table II.— Iberian Tardigrada species classified by class, order, family, genus and species. This table contains the following information: Tardigrada species names, supraspecific categories, synonymies, number of localities (corresponding to that in Table III and Fig. 1) in the Iberian Peninsula, the Balearic Islands and Chafarinas Islands, habitats-substratums where found and the first published record in the Iberian Peninsula per each species. Marked with a box new records for Iberian Peninsula, the Balearic Islands and Chafarinas Islands (inside brackets, number of specimens found). M= moss, L= lichen, H= leaf-litter, Hep= hepatic, R= rock, E= soil, Ac= freshwater, Ch= pool, Es= pond, TA= water tank, SM= marine sediment, AM= marine algae, Cirr= barnacle, ISR= interstitial habitats from subterranean rivers, ICR= interstitial habitats from cave rivers. *= habitat-substratum not specified in article.

Tabla II.— Las especies ibéricas del *phylum* Tardigrada clasificadas por clase, orden, familia, género y especie. Además se incluye la siguiente información: nombre de las especies, categorías supraespecíficas, sinonimias, número de identificación de las localidades (que se corresponde con los de la Tabla III y la Fig. 1) de la Península Ibérica, Islas Baleares e Islas Chafarinas, hábitat–sustrato donde se han encontrado y artículo donde se citó la especie por primera vez para la Península Ibérica. Se han encuadro las especies que son cita por primera vez para la Península Ibérica, Islas Baleares e Islas Chafarinas (entre paréntesis número de specímenes encontrados). M= musgo, L= líquen, H= hojarasca, Hep= hepática, R= roca, E= edáfico, Ac= dulceacuícola, Ch= charca, Es= estanque, TA= tanque de agua, SM= sedimento marino, AM= alga marina, Cirr= cirrípedo, ISR= hábitats intersticiales asociados a ríos subterraneos, ICR= hábitats intersticiales de ríos cavernícolas. *= hábitat-sustrato no especificado en el artículo.

CLASS ORDER FAMILY GENUS ***SPECIES*** [SINONIMIES] [FIRST RECORD PAPERS] LOCALITIES	HABITAT-SUBSTRATUMS
EUTARDIGRADA Marcus, 1927	
APOCHELA Schuster , Nelson, Grigarick & Christenberry, 1980	
Milnesiidae Ramazzotti, 1962	
Milnesium Doyére, 1840	
Milnesium tardigradum Doyére, 1840 [Heinis, 1908; Da Cunha, 1941]	
11, 16, 18, 20, 25, 26, 27, 38, 43, 50, 60, 78, 85, 94, 95, 97, 108, 112, 114, 120, 123, 124, 128, 134, 137, 141, 143, 144, 145, 148, 151, 157, 158, 159, 161, 163b, 164, 169, 172, 173, 177, 179, 180, 182, 193, 211, 219, 225, 228, 231, 234, 241, 245	M, MR, L, LA, M+L, M+L A, M+L R, H
PARACHELA Schuster , Nelson, Grigarick & Christenberry, 1980	
Calohypsibiidae Pilato, 1969	
Calohypsibius Thulin, 1928	
Calohypsibius ornatus (Richters, 1900) [*Hypsibius (Calohypsibius) ornatus* (Richters, 1900); *Hypsibius (Calohypsibius) ornatus* + var. *spinosissima* Marcus, 1936; *Hypsibius (Calohypsibius) ornatus typicus* + *ornatus carpaticus* Bartos, 1940; *Hypsibius (Calohypsibius) armatus* Bartos; *Hypsibius (Calohypsibius) intermedius* Mihelcic, 1939; *Macrobiotus ornatus* var. *spinifer* Richters, 1900] [Da Cunha, 1941]	
40, 46, 49, 60, 66, 112, 139, 140, 150, 151	L, M+L, M+L A, F+M+L R
Calohypsibius placophorus (Da Cuhna, 1943) [*Hypsibius (Calohypsibius) placophorus* Da Cuhna, 1943] [Da Cunha, 1943]	
46	M+L, M+L A
Calohypsibius verrucosus (Richters, 1900) [*Hypsibius (Calohypsibius) scabrosus* Thulin, 1928; *Hypsibius (Calohypsibius) verrucosus* Richters, 1900; *Calohypsibius scabrosus* Thulin, 1928][Da Cunha, 1947 a]	
20, 39, 40, 114, 151	L, LR, MA
Hypsibiidae Pilato, 1969	
Astatumen Pilato, 1997	
Astatumen trinacriae (Arcidiacono, 1962 [*Itaquascon trinacriae* Arcidiacono, 1962] [Maucci & Durante Pasa, 1985]	
39, 112, 114, 115, 120b, 137, 138, 139, 140, 141	M+L
Diphascon Plate, 1889	
Adropion Pilato, 1987	
Diphascon (Adropion) prosirostre Thulin, 1928 [Maucci & Durante Pasa, 1984]	
29, 139	M+L
Diphascon (Adropion) scoticum Murray, 1905 [*Hypsibius (Diphascon) scoticus* Marcus, 1936; *Diphascon crozetense* Richters, 1907; *Hypsibius scoticus* Thulin, 1911; *Diphascon scoticus* Dastych, 1974] [Rodríguez Roda, 1946]	
127, 239	M, MR
Diphascon Pilato, 1987	
Diphascon (Diphascon) alpinum Murray, 1906 [*Hypsibius (Diphascon) alpinum* Marcus, 1936; *Hypsibius (Diphascon) alpinus* Murray, 1906] [Da Cunha, 1944 a]	
40, 44, 67, 104, 114, 131, 132, 156	M, MA, MR, M+L A, M+L R
Diphascon (Diphascon) chilenense Plate, 1888 [*Hysibius (Diphascon) chilenensis* Marcus, 1936] [Maucci & Durante Pasa, 1984]	
39, 43, 44, 115, 139, 141, 152, 153, 154, 155	M+L
Diphascon (Diphascon) nobilei (Binda, 1969) [*Hypsibius (Diphascon) nobilei* Binda, 1969][Maucci & Durante Pasa, 1984]	
104	*
Diphascon (Diphascon) nodulosum (Ramazzotti, 1957) [*Hypsibius (Diphascon) nodolosum* Ramazzotti, 1957]	
255 (16 specimens found)	H, LT (*Pinus sylvestris*)
Diphascon (Diphascon) oculatum Murray, 1906 [*Diphascon canadensis* Murray, 1910; *Hypsibius vancouverensis* Thulin, 1911; *Hypsibius (Diphascon) oculatus* Murray] [Rodríguez Roda, 1946]	
71, 128, 136, 239	LA, LE, LR, MR

CLASS
ORDER
FAMILY
GENUS
SPECIES [SINONIMIES] [FIRST RECORD PAPERS]
LOCALITIES — HABITAT-SUBSTRATUMS

Diphascon (Diphascon) pingue (Marcus, 1936) [*Hypsibius (Diphascon) pingue* Marcus, 1936]
256 (1 specimen found), 257 (1 specimen found) — H (Oaks), MR

Diphascon (Diphascon) recamieri Richters, 1911 [*Hypsibius (Diphascon) recamieri* Marcus, 1936 *et Auct*.; *Isohypsibius recamieri* Richters, 1911] [Mihelcic, 1954]
64, 99 — MA, H

Diphascon (Diphascon) rugocaudatum (Rodríguez Roda, 1952) [*Hypsibius (Diphascon) rugocaudatus* Rodríguez Roda, 1952] [Rodríguez Roda, 1952]
71 — LE

Diphascon (Diphascon) rugosum (Bartos, 1935) [*Hypsibius (Diphascon) rugosus* Bartos, 1935] [Rodríguez Roda, 1952]
28 — MR

Doryphoribius Pilato, 1969

Doryphoribius flavus (Iharos, 1966) [*Hypsibius flavus* Iharos, 1966*; Isohypsibius flavus* (Iharos, 1966); *Hypsibius (Isohypsibius) flavus* (Iharos, 1966); *Hypsibius (Doryphoribius) citrinus* Maucci, 1972; *Doryphoribius citrinus* (Maucci, 1972)] [Maucci & Durante Pasa, 1984]
70 — MA

Hebesuncus Pilato, 1987

Hebesuncus conjungens (Thulin, 1911) [*Diphascon conjugens* Thulin, 1911; *Hypsibius conjugens* Thulin, 1991; *Hypsibius (Hypsibius) conjugens* Marcus, 1936] [Da Cunha, 1941]
9, 114, 133, 157 — M+L, M+L+Hep Dv

Hypsibius Ehrenberg, 1848

Hypsibius camelopardis Ramazzotti & Maucci, 1983 [Ramazzotti & Maucci, 1983]
43, 61 — M+L

Hypsibius convergens (Urbanowicz, 1925) [Da Cunha, 1941]
10, 12, 13, 28, 31, 69, 79, 96, 107, 108, 115, 126, 139 — M, MR, M+L, H

Hypsibius dujardini (Doyère, 1840) [*Macrobiotus dujardin* Doyére, 1840; *Macrobiotus lacustris + palustriz* Dujardin, 1851; *Macrobiotus tetradactylus* Lance, 1896; *Macrobiotus murrayi* Richters, 1907; *Macrobiotus breckneri* Richters, 1910; *Macrobiotus samoanus* Richters, 1908; *Macrobiotus ursellus* Della Valle, 1915; *Hypsibius dujardini + murrayi* Marcus, 1929] [Rodríguez Roda, 1949]
45, 64, 67, 84 — M, MAc, MR, H

Hypsibius microps Thulin, 1928 [*Hypsibius pallidus* Cuénot, 1932 (no Thulin, 1911)] [Maucci & Durante Pasa, 1984]
67, 74, 139, 152, 175, 246 — MA, M+L

Hypsibius pallidus Thulin, 1911 [*Macrobiotus convergens* Urbanowicz, 1925; *Hypsibius microps* Thulin, 1928] [Da Cunha, 1941]
10, 29, 31, 40, 50, 66, 79, 114, 126, 134, 239, 242 — FR, LA, LR, M, MR, M+L, M+L A

Hypsibius scabropygus Cuénot, 1929 [Rodríguez Roda, 1952]
71, 72 — LA, LE

Hypsibius scabrosus (Murray, 1911) [*Macrobiotus ornatus* Richters; *Hypsibius verrucosus* (Thulin, 1991 and Marcus, 1928); *Calohypsibius scabrosus* Thulin, 1928] [Da Cunha, 1944 a]
40, 66 — LA, LR, M+L

Isohypsibius Thulin, 1928

Isohypsibius annulatus (Murray, 1911) [*Macrobiotus annulatus* Murray, 1905; *Hypsibius annulatus* Thulin, 1911; *Hypsibius (Isohypsibius) annulatus* Marcus 1929 y 1936; *Hypsibius (Isohypsibius) annulatus* Ramazzotti, 1962 y 1972] [Rodríguez Roda, 1949]
29, 84, 109 — Mac

Isohypsibius josephi (Iharos, 1964) [*Hypsibius (Isohypsibius) josephi* Iharos, 1964] [Maucci & Durante Pasa, 1985]
163 — M+L

Isohypsibius lunulatus (Iharos, 1966) [*Hypsibius (Isohypsibius) lunulatus* Iharos, 1966] [Maucci & Durante Pasa, 1984]
35, 111, 175 — M+L

Isohypsibius mammillosus (Iharos, 1964) [*Hypsibius (Isohypsibius) mammillosus* Iharos, 1964] [Fontoura, 1982]
107 — M

Isohypsibius marcellinoi (Binda & Pilato, 1971) [*Hypsibius (Isohypsibius) marcellinoi* Binda & Pilato, 1971]
258 (1 specimen found) — Algae from a freshwater pond

Isohypsibius monstruosus Maucci, 1991 [Maucci, 1991]
13 — M

Isohypsibius montanus (Mihelcic, 1938) [*Hypsibius (Isohypsibius) josephi* Iharos, 1964; *Hypsibius (Isohypsibius) montanus* Mihelcic, 1938] [Lewin Osorio, 1984]
124 — M

Isohypsibius nodosus (Murray, 1907) [*Hypsibius (Isohypsibius) nodosus* Murray, 1907] [Mihelcic, 1955]
65 — MA

Isohypsibius prosostomus (Thulin, 1928) [*Hypsibius (Isohypsibius) prosostomus* Thulin, 1928] [Da Cunha, 1948]
13, 44, 51, 77, 107, 126, 135, 183, 184 — LR, M, M+L

Isohypsibius sattleri (Richters, 1902) [*Isohypsibius bakonyiensis* Iharos, 1964; *Hypsibius (Isohypsibius) sattleri* (Richters, 1902) *et Auct*. (*partim*)] [Da Cunha, 1947a]
29, 65, 73, 118, 221 — MA, M+L, M+L A

Itaquascon Barros, 1939

Itaquascon ramazzottii Iharos, 1966 [Fontoura, 1981]
107, 114 — M, M+L A, M+L R

CLASS
ORDER
FAMILY
GENUS
SPECIES [SINONIMIES] [FIRST RECORD PAPERS]
LOCALITIES — HABITAT-SUBSTRATUMS

Pseudobiotus Schuster, Nelson, Grigarick & Christenberry, 1980

Pseudobiotus augusti Muray, 1907 [*Macrobiotus augusti* Murray, 1907; *Macrobiotus lacustri* Wenck, 1914; *Hypsibius augusti + dujardini* Marcus, 1928 *par tim*; *Isohypsibius megalonyx + augusti* Thulin, 1928; *Hypsibius (Isohypsibius) megalonyx + augusti* Marcus, 1936] [Mihelcic, 1954]
23 — MR

Ramazzottius Binda & Pilato, 1986

Ramazzottius novemcinctus Marcus, 1936 [*Hypsibius novemcinctus* Marcus, 1936] [McInnes, 1991]
90 — MR

Ramazzottius oberhaeuseri (Doyére, 1840) [*Hypsibius oberhauseri* Doyére, 1840; *Macrobiotus oberhaeuser* Doyére, 1840; *Macrobiotus granulatus* Richters, 1908; *Macrobiotus spallanzanii* Della Valle, 1915] [Da Cunha, 1941]
10, 13, 26, 31, 43, 45, 48, 65, 97, 101, 105, 112, 114, 122, 129, 130, 131, 140, 141, 151, 155, 157, 180, 182, 211 — L, LA, LR, MA, M+L, M+L A, M+L R

Macrobiotidae Thulin, 1928

Dactylobiotus Schuster , Nelson, Grigarick & Christenberry, 1980

Dactylobiotus ambiguus (Murray, 1907) [*Macrobiotus ambiguus* Murray, 1907] [Rodríguez Roda, 1952]
80, 81, 109 — Mes, MTur

Dactylobiotus dispar (Murray, 1907) [*Macrobiotus dispar* Murray, 1907 *et Auct.*] [Rodríguez Roda, 1947]
82, 83, 84, 93 — Ch, Es, AEs, MAc

Dactylobiotus macronyx (Dujardin, 1851) [*Macrobiotus macronyx* Dujardin, 1851 *et Auct.*] [Barros & Da Cunha, 1937]
9, 116, 117 — TA, Mac

Dactylobiotus parthenogeneticus Bertolani, 1981
22 (6 specimens found), 253 (1 specimen found) — ISR, ICR

Dactylobiotus selenicus Bertolani, 1981
254 (4 specimens found) — ISR

Macrobiotus Schultze, 1833

Macrobiotus areolatus Murray, 1907 [*Macrobiotus echinogenitus* Richters, 1903 *partim* (no *M. echinegitus* Richters, 1904); *Hypsibius areolatus* Marcus 1936; *Macrobiotus richtersi* type 2 Petersen, 1951 (no Murray); *Macrobiotus harmsworthi* Hallas, 1972 *partim* (no Murray)] [Barros & Da Cunha, 1937]
9, 18, 19, 21, 43, 78, 85, 94, 107, 113, 120, 146, 147, 148, 158, 160, 163, 164, 175, 179, 196, 198, 199, 200, 201, 203 — M, M+L

Macrobiotus baltatus McInnes, 1991 [McInnes, 1991]
67, 89, 90 — MR

Macrobiotus dubius Murray, 1907 [Rodríguez Roda, 1952]
109 — M

Macrobiotus echinogenitus Richters, 1904 [*Macrobiotus crenulatus* Murray, 1907 (no *Macrobiotus echinogenitus* Richters, 1903)] [Heinis, 1908; Da Cunha, 1941]
16, 46, 66, 72, 86, 87, 185, 239 — MA, MDulc, MR, M+L A

Macrobiotus furciger Murray, 1906 [*Macrobiotus furcatus* Murray, 1906 (*nec* Ehrenberg, 1859); *Macrobiotus ehrenbergi* Heinis, 1921] [Maucci, 1991]
13 — M

Macrobiotus grandis Richters, 1911 [Lewin Osorio, 1984]
95 — M

Macrobiotus harmsworthi Murray, 1907 [*Macrobiotus echinogenitus* Richters, 1903 *partim*; *Macrobiotus tetrodon + astronensis* Della Valle, 1915; *Macrobiotus echinogenitus* Cuénot, 1932 (no Richters); *Macrobiotus harmsworthi* Hallas, 1972 *partim*] [Rodríguez Roda, 1951]
9, 19, 21, 29, 30, 43, 55, 58, 61, 63, 94, 96, 97, 98, 99, 100, 101, 103, 104, 105, 114, 154, 175, 180, 183, 186, 187, 188, 189 — E, H, M+L+Hep A, M+L+Hep R, M+L, M+L A, M+L R

Macrobiotus hufelandi Schultze, 1833 [*Macrobiotus eminens* Ehrenberg, 1859; *Macrobiotus hufelandii* Thulin, 1911; *Macrobiotus interruptus* Della Valle, 1914; *Arctiscon tetradactylum* Nitzsch, 1835; *Macrobiotus diodon* Della Valle, 1915] [Heinis, 1908; Da Cunha, 1941]
8, 9, 11, 16, 17, 18, 19, 20, 23, 25, 27, 29, 30, 38, 39, 40, 42, 43, 44, 46, 47, 50, 53, 54, 62, 63, 64, 65, 67, 72, 78, 94, 96, 99, 107, 108, 112, 113, 114, 115, 119, 120, 122, 137, 138, 139, 140, 141, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 157, 158, 159160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 179, 180, 182, 183, 184, 186, 187, 188, 189, 190, 191, 193, 194, 196, 198, 199, 200, 201, 203, 205, 206, 207, 208, 209, 210, 212, 213, 214, 215, 216, 217, 219, 220, 221, 222, 223, 224, 225, 227, 228, 231, 232, 233, 234, 236, 237, 239, 241, 242, 243, 244 — H, LA, M+L+Hep A, M+L+Hep R, M+L+Hep Dv, MA, ME, MR, M+L, M+L A

Macrobiotus lusitanicus Maucci & Durante, 1986 [Maucci & Durante Pasa, 1985]
112, 113, 114, 115 — ME, MR, M+L

Macrobiotus montanus Murray, 1910 [*Macrobiotus morulatus* Bartos, 1936] [Maucci & Durante Pasa, 1984]
55, 100 — *

Macrobiotus occidentalis Murray, 1910 [Barros & Da Cunha, 1937]
9, 11, 114 — LA, M+L

Macrobiotus orcadensis Murray, 1907 [Fontoura, 1981]
95, 114 — L, M

Macrobiotus pallarii Maucci, 1954 [*Macrobiotus aviglianae* Robotti, 1970] [Lewin Osorio, 1984]
50 — M

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Macrobiotus persimilis Binda & Pilato, 1972 [Maucci & Durante Pasa, 1984]
118, 119, 120, 122 M+L

Macrobiotus pseudofurcatus Pilato, 1972 [Maucci & Durante pasa, 1985]
25 M+L

Macrobiotus recens Cuénot, 1932 [*Macrobiotus hufelandi* forma *recens* Marcus 1936;*Macrobiotus hufelandi recens* Ramazzotti, 1962 and 1972 (no *Macrobiotus recens* Grigarick, Schuster & Toftner, 1973; no *Macrobiotus recens* Horning, Schuster & Grigarick, 1978)] [Maucci, 1979]
19, 24, 25, 26, 37, 40, 42, 43, 52, 55, 61, 114, 115, 119, 120b, 137, 139, 140, 151, 155, 158, 159, 161, 162, 163, 163b, 171, 172, 173, 177, 183, 186, 190, 198, 206, 211, 212, 213, 214, 215, 216, 217, 219, 220, 221 L, M, M+L, M+L A, M+L R

Macrobiotus richtersi Murray, 1911 [*Macrobiotus harmsworthi* Thulin, 1911 (*nec* Murray); *Macrobiotus schultzei* Greeff, 1966; *Macrobiotus richertsi* Marcus, 1936 *partim*; *Macrobiotus richtersii* type I Petersen, 1951; *Macrobiotus harmsworthi* Hallas, 1972 *partim* (*nec* Murray)] [Rodríguez Roda, 1946]
13, 18, 29, 39, 42, 43, 50, 62, 72, 78, 83, 94, 95, 97, 106, 123, 124, 148, 149, 160, 163, 163b, 164, 167, 172, 175, 179, 182, 184, 186, 198, 200, 201, 208, 213, 221, 222, 223, 224, 225, 227, 228, 231, 232, 233, 234, 236, 241, 244 LA, LR, M, MR, M+L

Macrobiotus tetraplacoides Fontoura, 1981 [Fontoura, 1981]
180 LA, LR

Minibiotus Schuster , Nelson, Grigarick & Christenberry, 1980

Minibiotus furcatus (Ehrenberg, 1859) [*Macrobiotus furcatus* Ehrenberg, 1859; *Macrobiotus luteus* Thulin, 1928] [Da Cunha, 1941]
18, 24, 27, 40, 44, 61, 94, 114, 139, 157, 180, 211 LA, M+L, M+L A. M+L R

Minibiotus hufelandioides (Murray, 1910) [*Macrobiotus hufelandioides* Murray, 1910] [Mihelcic, 1954]
23, 64 C, MR

Minibiotus intermedius (Plate, 1888) [*Macrobiotus intermedius* Plate, 1888] [Heinis, 1908; Da Cunha, 1941]
9, 16, 20, 24, 25, 27, 29, 42, 43, 44, 45, 61, 67, 76, 87, 89, 94, 97, 104, 110, 111, 112, 113, 114, 120b, 122, 137, 138, 139, 147, 148, 150, 157, 158, 160, 163, 166, 169, 171, 175, 183, 186, 190, 193, 199, 205, 206, 207, 208, 209, 210, 243 M+L+Hep, M, MA, MR, M+L, M+L R

Murrayon Bertolani & Pilato, 1988

Murrayon dianeae (Kristensen, 1982) [*Macrobiotus dianeae* Kristensen, 1982]
255 (4 specimens found) MR, MT (*Pinus sylvestris*)

Murrayon hibernicus (Murray, 1911) [*Macrobiotus hibernicus* Murray, 1911] [Da Cunha, 1948]
67, 106, 221 MA, M+L

Murrayon pullari (Murray, 1907) [*Macrobiotus pullari* Murray, 1907; *Macrobiotus dubius* Murray] [Da Cunha, 1947 a]
84, 240 M, Mac

Richtersius (Pilato & Binda, 1987)

Richtersius coronifer (Richters, 1903) [*Macrobiotus coronifer* Richters, 1903; *Richtersia coronifer* (Richters, 1903); *Adorybiotus coronifer* (Richters, 1903)] [Rodríguez Roda, 1946]
13, 28, 64, 72 M

HETEROTARDIGRADA Marcus, 1927
ARTHROTARDIGRADA Marcus, 1927
Batillipedidae Ramazzzotti, 1962
Batillipes Richters, 1909

Batillipes dicrocercus Pollock, 1970 [Maucci & Durante Pasa, 1984]
4 SM

Batillipes marcelli Morone de Lucia, R. M., d'Addabbo-Gallo, M. & Grimaldi de Zio, S., 1988 [Villora Moreno & De Zio Grimaldi, 1996]
250 SM

Batillipes mirus Richters, 1909 [Rodríguez Roda, 1947]
4 SM

Batillipes pennaki Marcus, 1946 [Villora Moreno, 1993]
249 SM

Batillipes phreaticus Renaud-Debyser, 1959 [Villora Moreno, 1993]
247, 248, 249 SM

Halechiniscidae Ramazzotti, 1962
Actinarctus Schulz, 1935

Actinarctus doryphorus Schulz, 1935 [Villora Moreno & De Zio Grimaldi, 1996]
252 SM

Actinarctus physophorus Grimaldi de Zio, S., d'Addabbo Gallo, M., Morone de Lucia, R. M., Vacoarella, R. & Grimaldi, P., 1982 [Villora Moreno & De Zio Grimaldi, 1996]
252 SM

Bathyechiniscus Steiner, 1926

Bathyechiniscus tetronyx Steiner, 1926 [*Styraconyx sargassi* Thulin, 1942] [Rodriguez Roda, 1947]
1, 2, 3 AM, SM

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Florarctus Delamare-Deboutteville &Renaud-Mornant, 1965

Florarctus acer Renaud-Mornant, 1989 [Villora Moreno & De Zio Grimaldi, 1996]
252 SM

Florarctus asper Renaud-Mornant, 1989 [Villora Moreno & De Zio Grimaldi, 1996]
251 SM

Florarctus cinctus Renaud-Mornant, 1976 [Villora Moreno & De Zio Grimaldi, 1996]
250 SM

Florarctus hulingsi Renaud-Mornant, 1976 [Villora Moreno & De Zio Grimaldi, 1996]
250, 251 SM

Florarctus stellatus Renaud-Mornant, 1989 [Villora Moreno & De Zio Grimaldi, 1996]
250 SM

Halechiniscus Richters, 1908

Halechiniscus chafarinensis Grimaldi & Villora Moreno, 1996 [De Zio Grimaldi & Villora Moreno, 1996]
250 SM

Halechiniscus greveni Renaud-Mornant & Deroux, 1976 [Villora Moreno & De Zio Grimaldi, 1996]
252 SM

Halechiniscus perfectus Schulz, 1951 [Villora Moreno & De Zio Grimaldi, 1996]
252 SM

Halechiniscus remanei Schulz, 1951 [Villora Moreno & De Zio Grimaldi, 1996]
250 SM

Styraconyx Thulin, 1942

Styraconyx craticulus (Pollock, 1983) [*Bathyechiniscus craticulus* Pollock, 1983] [Villora Moreno & De Zio Grimaldi, 1996]
250 SM

Stygarctidae Schulz, 1951
Stygarctus Schulz, 1951

Stygarctus bradypus Schulz, 1951 [Villora Moreno & De Zio Grimaldi, 1996]
251 SM

ECHINISCOIDEA Marcus, 1927
Echiniscidae Thulin, 1928
Bryodelphax Thulin, 1928

Bryodelphax mateusi (Fontoura, 1982) [*Echiniscus (Bryodelphax) mateusi* Fontoura, 1982] [Fontoura, 1982]
107 M

Bryodelphax parvulus Thulin, 1928 [*Echiniscus (Bryodelphax) parvulus* Thulin, 1928; *Echiniscus intermedius* Murray, 1910; Thulin, 1911] [Da Cunha, 1941]
8, 9, 10, 11, 28, 146, 147, 148, 149 M+L, M+L A

Bryodelphax tatrensis (Weglarska, 1959) [*Echiniscus (Bryodelphax) tatrensis* Weglarska, 1959] [Maucci & Durante Pasa, 1984]
12, 13 M

Cornechiniscus Maucci & Ramazzotti, 1981

Cornechiniscus lobatus (Ramazzotti, 1943b) [*Pseudechiniscus cornutus* forma *lobata* Ramazzotti, 1943b; *Pseudechiniscus cornutus lobatus* Ramazzotti, 1962 y 1972; *Pesudechiniscus cornutus* Mihelcic, 1966; Dastych, 1972 (no Richters, 1906)] [Maucci & Durante Pasa, 1984]
14 ME

Cornechiniscus subcornutus Maucci & Ramazzotti, 1981 [Maucci & Ramazzotti, 1981]
15 ME

Echiniscus Schultze, 1840

Echiniscus bisculptus Maucci, 1983 [Maucci & Durante Pasa, 1985]
165 M+L

Echiniscus bisetosus Heinis, 1908 [Maucci & Durante Pasa, 1984]
18, 19, 158, 159 M+L

Echiniscus blumi Richters, 1903 [*Echiniscus ramazzotti* Binda & Pilato, 1969; *Echiniscus punctulatus* Mihelcic, 1955; *Echiniscus bellus* Mihelcic, 1955] [Da Cunha, 1941]
20, 65, 137 MA, M+L

Echiniscus canadensis Murray, 1910 [*Echiniscus punctulatus* Mihelcic, 1955; *Echiniscus bellus* Mihelcic, 1967; *Echiniscus (Echiniscus) canadensis* Marcus, 1936] [Da Cunha, 1941]
18, 19, 21, 22, 23, 24, 25, 26, 27, 43, 65, 94, 119, 139, 158, 159, 161, 162, 163, 164 L, MR, M+L, M+L R

Echiniscus granulatus (Doyère, 1840) [*Emydium granulatum* + *granulosum* Doyére, 1840; *Echiniscus crassus* Richters *et al*., 1904; *Echiniscus abanti*, Maucci, 1972; *Echiniscus fortis* Bartos, 1935] [Rodríguez Roda, 1946]
8, 12, 13, 23, 28, 29, 30, 31, 33, 34, 35, 107, 108, 160 M, ME, MR, M+L

Echiniscus lichenorum Maucci, 1983 [Maucci, 1983]
122, 166 LA, LE, M+L

Echiniscus mediantus Marcus, 1930 [Rodríguez Roda, 1949]
23, 25, 37, 38, 139, 158, 163b, 167 M+L, M+L R

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Echiniscus merokensis Richters, 1904 [*Echiniscus iharosi* Rudescu, 1964] [Da Cunha, 1944 a]
11, 19, 25, 29, 39, 40, 41, 42, 43, 44, 45, 107, 113, 139, 141, 168, 169, 170, 171, 172, 173, 174, 175 — M+L+HepA, M+L+Hep R, M+L, M+L A

Echiniscus multispinosus Da Cunha, 1944 [Da Cunha, 1944 b]
40, 114, 157 — M+L+HepA, M+L+Hep R, MA

Echiniscus oihonnae Richters, 1903 [Da Cunha, 1944 a]
9, 40, 46, 47, 112, 114, 151 — L, LA, M+L, M+L A

Echiniscus quadrispinosus Richters, 1902 [*Echiniscus scrofa* Richters, 1902; *Echiniscus (Echiniscus) quadrispinosus* Marcus, 1936] [Heinis, 1908; Da Cunha, 1941]
17, 48, 49, 50, 124, 151, 175 — L, M, M+L

Echiniscus scabrospinosus Fontoura, 1982 [Fontoura, 1982]
107 — M

Echiniscus sinuloides Murray, 1907 [Maucci & Durante Pasa, 1984]
51 — M

Echiniscus spinulosus (Doyère, 1840) [Maucci & Durante Pasa, 1984]
9, 35, 52, 146 — M+L

Echiniscus testudo (Doyère, 1840) [*Emydium testudo* Doyére, 1840; *Echiniscus bellermanni* Schultze, 1840; *Echiniscus inermis* Richters, 1902; *Echiniscus trifilis* Rahm, 1921; *Echiniscus filamentosus mongoliense* Iharos, 1973 (no *E. filamentosus* Plate, 1888)] [Rodríguez Roda, 1949]
14, 35, 52, 53, 55, 56, 58, 59 — MR, M+L, M+L R

Echiniscus trisetosus Cuénot, 1932 [*Echiniscus granulatus* Murray, 1905 (no *Echiniscus granulatus* Doyére); *Echiniscus granulatus* Murray, 1929] [Rodríguez Roda, 1946]
8, 18, 20, 21, 23, 25, 26, 30, 39, 45, 60, 61, 62, 63, 64, 66, 164, 176, 177, 179 — H, L, M, MA, ME, MR, M+L, M+L R

Hypechiniscus Thulin, 1928
Hypechiniscus gladiator (Murray, 1905) [*Echiniscus gladiator* Murray, 1905; *Echiniscus (Hypsibius) gladiator* Marcus, 1929; *Parechiniscus unispinosus* Da Cuhna, 1947b] [Maucci & Durante Pasa, 1984]
39, 66 — A

Parechiniscus Cuénor, 1926
Parechiniscus chitonides Cuénot, 1926 [Rodríguez Roda, 1946]
8, 72 — M, MR
Parechiniscus unispinosus Da Cunha, 1947b [Da Cunha, 1947 b]
39, 66 — M+L, M+L E

Pseudechiniscus Cuénot, 1926
Pseudechiniscus clavatus Mihelcic, 1955 [Mihelcic, 1955]
65 — MA

Pseudechiniscus facettalis (Petersen, 1951) [*Pseudechiniscus suillus* forma *facettalis* Petersen, 1951; *Pseudechiniscus pseudocoronifer* forma *facettales* Maucci, 1954; *Pseudechiniscus suillus facettalis* Ramazzotti, 1962 y 1972] [Maucci & Durante Pasa, 1984]
29, 67, 68, 69, 120b, 237 — MA, MR, M+L

Pseudechiniscus insolitus Maucci, 1988 [Maucci, 1991]
13 — M
Pseudechiniscus pseudocoronifer Ramazzotti, 1943a [Maucci & Durante Pasa, 1984]
70 — MA

Pseudechiniscus suillus (Ehrenberg, 1853) [*Echiniscus suillus* Ehrenberg, 1853; *Echiniscus mutabilis* Murray, 1905; *Echiniscus arctomys Auct*. (no Ehrenberg) 1902-1910] [Da Cunha, 1941]
9, 11, 12, 20, 25, 31, 40, 46, 47, 51, 66, 71, 72, 73, 74, 75, 76, 77, 78, 79, 107, 112, 113, 114, 139, 140, 141, 148, 150, 151, 152, 153, 158, 162, 164, 180, 217 — L, LA, M, MR, M+L, M+L A, M+L R

Testechiniscus Kristensen, 1987
Testechiniscus spinuloides (Murray, 1907) [*Echiniscus spinuloides* Murray, 1907] [Maucci & Durante Pasa, 1984]
51 — M

Echiniscoididae Kristensen & Hallas, 1980
Echiniscoides Plate, 1889
Echiniscoides sigismundi hispaniensis Kristensen & Hallas, 1980 [Kristensen & Hallas, 1980]
6, 250, 251 — CirrM, SM

Echiniscoides sigismundi mediterraneus Kristensen & Hallas, 1980 [Kristensen & Hallas, 1980]
7 — AM, LM

Table III.— Localities list from the Iberian Peninsula, the Balearic Islands and Chafarinas Islands where tardigrade species have been found, with the following information: Country, Autonomic Community (for Spain) or Region (for Portugal), Province (for Spain) or District (for Portugal), identification number for each locality (#Loc) which corresponds to that on Fig. 1, number of registers (# registers), number of species (# spp), types of habitat-substratum sampled for each locality (H-S types) and UTM coordinates for each locality, as precise as possible. *1= found in literature but not geographic information; *2= geographic information found in literature but no UTM information. New= new localities sampled with respect to Tardigrada *phylum*. Other abbreviations as in Table II.

Tabla III.— Lista de las localidades de la Península Ibérica, Islas Baleares e Islas Chafarinas donde se ha encontrado alguna especie del *phylum* Tardigrada. Presentamos además la siguiente información: país, comunidad autónoma (para España) o región (para Portugal), provincia (para España) o distrito (para Portugal), número de identificación para cada localidad (#Loc) que se corresponde con los números de la Figura 1, número de registros (# registers), número de especies (# spp), tipos de hábitat-sustratos muestreados en cada localidad (H-S types) y coordenadas UTM para cada localidad, tan preciso como ha sido posible. *1= encontrado en la bibliografía pero sin información geográfica; *2= encontrada información geográfica en la bibliografía pero sin coordenadas UTM. New= nueva localidad muestreada respecto al *phylum* Tardigrada. Otras abreviaturas como en la Tabla II.

Country **Autonomic Comunity (Spain) / Region (Portugal)** **Province (Spain) / District (Portugal)**	**#Loc**	**Localities**	**#registers**	**#Spp**	**H-S types**	**UTM**
Andorra						
	29	Andorra	13	11	M	31TCH
España						
Andalucía						
	69	Venta de Roja*1	2	2		
Granada	35	El Zegrí	4	4		30SVG4542
	118	Loja	2	2		30SUG9714
Huelva	61	Santa Olalla	6	6		29SQA24
Jaén	22	Despeñaperros	1	1		30SVH55
	68	Santa Elena	1	1		30SVH5243
Málaga	70	Gaucín	3	3	MA	30STF95
	52	Atajate	2	2		30STF9957
Sevilla	105	El Ronquillo	2	2		29SQB47
Aragón						
Huesca	31	Biescas (between Sarvisé and Fiscal)	5	5		30TYN1923
	59	Binéfar	1	1		31TBG7537
	51	Broto	5	5	M, MR	30TYN32
	246	Road between Sarvisé and Fiscal	1	1		30TYN31
	111	Fiscal	2	2		30TYN3609
	15	Huesca	1	1	ME	30TYM1468
	48	Jaca	2	2	M+L, L	30TYN01
	74	Linas de Broto	2	2		30TYN32
	12	Paso Foradada	3	3		31TBG8268
	14	Peraltilla	2	2	ME	30TYM4660
	75	Sarvisé	1	1		30TYN3618
	71	Selva de Oza	4	4	LE, M+L A	30TXN84
	67	Valle de Ordesa	10	9	M, MA, MR	30TYN32
Zaragoza	101	El Frasno	2	2		30TXL2586
Cantabria						
Cantabria	77	Peña Vieja	3	3		30TUN61
	65	Santander	8	7	MA, MR	30TVP31
	253	Sumidero del Calderón (Venta Fresnedo, Sierra de la Collada)	New	New	ICR	30T0378440-4792244
Castilla La Mancha						
Ciudad Real	129	Ciudad Real	1	1	M+L	30SVJ1915
	145	Alcázar de San Juan	1	1	MR	30SVJ8260
	21	Almuradiel	3	3	M	30SVH5663
	144	Pedro Muñoz	1	1	LA	30SWJ0461
Toledo	53	Close to Toledo train station	2	2	MR	30SVK1212
Castilla León						
Ávila	63	Arévalo	3	3	H, ME	30TUL5547
	30	Ávila	9	4	H, MA, ME, MR	30TUL5602
Salamanca	45	Fuentes de Oñoro	5	5	MR	29TPE8596
	131	La Orbada	2	2		30TTL9153
	104	Sancti Spiritus	5	4	MA	29TQF2002
	34	Aldehuela de la Bóveda	1	1		29TQF42
	33	San Román	1	1		29TQF53

Country / Autonomic Comunity (Spain) / Region (Portugal) / Province (Spain) / District (Portugal)	#Loc	Localities	#registers	#Spp	H-S types	UTM
Valladolid	130	La Pedraja del Portillo	1	1		30TUL6292
Cataluña						
Barcelona	1	Arenys del Mar	1	1	SM	31TDG60
	93	Barcelona	1	1	Es	31TDF28
	126	Calaf	1	3		31TCG72
	241	Las Planas	3	3	M	31TDG28
	80	Río Tenes (Bigas)	1	1		31TDG31
	95	San Lorenzo de Munt (Tarrasa)	4	4	M	31TDG1909
	244	Santa Fe del Montseny	2	2	M	31TDG52
	97	Tibidabo	6	5	L, M+L, M	31TDF28
	124	Vallgorguina - Sant Celoni	4	4	M	31TDG5910
Gerona	4	Cala de Trons (between Lloret de Mar and Tossa)	2	2	SM	31TDG91
	143	Caldas de MalaVella	1	1	M+L	31TDG83
	110	Camprodón	1	1		31TDG4785
	109	Circo de Engors	3	3	M, Mturb	31TCH00
	81	Engars	1	1	Mes	31TCH00
	127	Falgars d'en Bas	1	1	M	31TDG5359
	134	Malniu ("Estany de Malniu")	2	2	FR, M+L	31TCH00
	132	Massanas	2	1	MA	31TDG7124
	83	Minyons	1	2	Pond	31TCH00
	100	Molló	2	2		31TDG58
	243	Santa Cristina d'Aro	2	2	M	31TEG02
Lleida	90	La Font Grassa (Aigües Tortes National Park)	2	2	MR	31TCH42
	82	Lago de Ibars de Noguera	2	1	AEs	31TBG9936
	136	Lago de San Mauricio (Aigües Tortes National Park)	1	1	LR	31TCH42
	98	Lleida	1	1	M+L	31TCH33
	55	Organyá	4	4		31TCG67
	50	Port del Compte-Solsona	7	6	M	31TCG75
	73	Río Noguera de Tor (between Bohí and Erill la Val)	3	2	LA, M+L, M+L A	31TCH21
	89	Valle de Subenuix (Aigües Tortes National Park)	3	2	MR, M+L R	31TCH42
Tarragona	249	Cala Romana	2	2	SM	31TCF55
	242	Cambrils	2	2	M	31TCF34
	7	Tarragona	1	1	SM	31TCF55
Ciudad Autónoma de Melilla						
Melilla	252	Congreso Island; Chafarinas Islands (Alborán Sea) *2	6	6	SM	
	250	Isabel II Island; Chafarinas Islands (Alborán Sea) *2	8	8	SM	
	251	Rey Francisco Island; Chafarinas Islands (Alborán Sea) *2	5	5	SM	
Comunidad de Madrid						
Madrid	60	Road from Puerto de Navacerrada to Puerto de Cotos	3	3	F+M+L R, MR	30TVL1310
	64	Casa de Campo	12	5	H, Grass, MA, ME	30TVK37
	108	El Pardo	5	4	H, ME	30TVK3486
	96	Real Jardín Botánico	3	3	H, MR	30TVK3380
	84	Peñalara (Sierra de Guadarrama)	4	4	MAc	30TVL1310
	91b	Presa del Villar (close to Manjirón)	1	1	S	30TVL5233
	54	Puerto de Cotos (Sierra de Guadarrama)	1	1	M	30TVL1310
	23	San Lorenzo de El Escorial	1	7	MA, MR, M+L R	30TVK0798
	254	Río Jarama (Patones)	New	New	ISR	30TVL5923
	255	Puerto de Canencia	New	New	LR, H (*Pinus sylvestris*)	30T0435504-4524770
	256	Acebeda	New	New	H (Oaks)	30T0435504-4524770
	257	"El Ventorrillo" Biological Station	New	New	MR	30T0414036-4512512
	258	Quijorna/Navalagamella	New	New	Algae from a freshwater pond	30TVK1075/30TVK0580
	99	Villalba	4	3	H, MA, MR	30TVK19
Comunidad Valenciana						
Alicante	2	Altea	1	1	AM	31SYH57
Valencia	56	Corbera	1	1	M+L	30SYJ2837
	247	El Saler	1	1	SM	30SYJ27
	248	Mareny de San Lorenzo	1	1	SM	30SYJ34
	91a	Onteniente	2	1	Es	30SY0700
	58	Sueca	3	2	M+L R, S	30SYJ3342
Extremadura						
Badajoz	37	Monesterio	2	2		29SQC31
Galicia						
La Coruña	6	La Coruña	1	1	CirrM	29TNJ4804
Islas Baleares						
Mallorca	3	Puerto de la Pollensa	1	1	AM	31SEE01
La Rioja						
La Rioja	76	Sierra de la Demanda	2	2		30TVM07

Country Autonomic Comunity (Spain) / Region (Portugal) Province (Spain) / District (Portugal)	#Loc	Localities	#registers	#Spp	H-S types	UTM
Navarra						
Navarra	239	Igaratza mountain refuge (Sierra de Aralar)	5	3	MR	30TWN85
	185	Cueva Aparein (entrance; Sierra de Aralar)	1	1	MR	30TWN85
	191	Cueva de Basolo (entrance; Sierra de Aralar)	1	1	MA	30TWN85
	72	Cueva Putxerri (entrance; Sierra de Aralar)	9	4	LA, MR	30TWN85
	8	Between Igaratza refuge and río Unaga (Sierra de Aralar)	5	4	M, MR	30TWN85
	156	Monte Kilixketa (Sierra de Aralar)	1	1	M	30TWN85
Navarra/País Vasco						
Navarra/Guipúzcoa						
	28	Sierra de Aralar	5	4	M, MR, M+L	30TWN85
Principado de Asturias						
Asturias	13	Peña Santa (close to Vegarredonda mountain refuge)	11	10	M	30TUN61
Portugal						
Algarve						
Faro	122	Almansil	6	5	LA, M+L	29SNB91
	228	Besanfim	3	3	M+L	29SNB21
	166	Maria Vinagre	4	3	LE, M+L	29SNB24
	94	Monchique	16	8	L, LA, M+L+Hep, M+L, M+L A, M+L R	29SNB33
	120	Vila Real de Santo Antonio	8	4	M+L	29SPB42
Alto Alentejo	167	Conv. de Barra*1	4	3	M+L	
Evora	200	Brotas	4	3	M+L	29SND70
	210	Ciborro	2	2	M+L	29SNC70
	179	Extremos	6	5	M+L	29SPD20
	163	Evora	7	7	M+L	29SNC96
	163b	Evora Monte	4	4	M+L	29SNC96
	232	Lavre	2	2	M+L	29SNC59
	148	Montemor	7	7	M+L	29SNC67
	186	Portel	5	5	M+L	29SPC14
	158	Redondo	9	9	M+L	29SPC27
	162	S. Manços	3	3	M+L	29SPC16
	220	Vimieiro	2	2	M+L	29SNC09
Portoalegre	119	Alpalhao	4	4	M+L	29SPD16
	161	Arez	4	4	M+L	29SPD06
	62	Arronches	4	3	M, M+L	29SPD43
	201	Crato	3	3	M+L	29SPD14
	123	Elvas	2	2	M+L	29SPD50
	231	Fronteira	3	3	M+L	29SPD12
	164	Monforte	7	6	M+L	29SPD32
	227	Montargil	2	2	M+L	29SND62
	43	Niza	20	12	LA, LR, M+L+Hep, M, M+L, M+L A, M+L R	29SPD17
	42	Portalegre	7	5	M, M+L	29SPD35
	24	San Vicente (close to Elvas village)	5	4	M	29SPD50
	221	Vale do Peso	5	5	MA, M+L	29SPD26
Baixo Alentejo						
Beja	203	Almódavar	2	2	M+L	29SNB85
	149	Alvito	4	3	M+L	29SNC84
	233	Ferreira do Alentejo	2	2	M+L	29SNC81
	187	Mértola	2	2	M+L	29SPB27
	175	Odemira	9	9	M+L	29SNB36
	236	Vila Alva	2	2	M+L	29SNC93
	234	Vila Ruiva	3	3	M+L	29SNC93
Beira Alta						
Guarda	26	Arrifana	7	5	M, M+L	29TPE18
	198	Celorico	4	4	M+L	29TPE39
	25	Guarda	17	10	M, M+L,M+L A, M+L R	29TPE48
	44	Pinzio	8	7	M+L	29TPE60
	27	S. Giao	9	5	LA, M+Lhep, M+L, M+L A, M+L R	29TPE16
	47	Vilar Formoso	3	3	M+L	29TPE89
Viseu	155	Castro Daire	4	4	M+L	29TNF82
	217	Fail	3	3	M+L	29TNE89
	208	Fornos de Algodres	3	3	M+L	29SPE20
	209	Lordosa	2	2	M+L	29SNF92
	141	Santa Comba Dao	7	7	M+L	29TNE77
	139	Serra do Caramulo	14	14	M+L	29TNE79
	174	Tondela	2	8	M+L	29TNE78

Country / Autonomic Comunity (Spain) / Region (Portugal) / Province (Spain) / District (Portugal)	#Loc	Localities	#registers	#Spp	H-S types	UTM
	40	Viseu	22	13	LA, LR,M+L+Hep A MA, M+L, M+L Aand R	29TNF90
	140	Vouzela	7	6	M+L	29TNF70
Beira Baixa						
Castelo Branco	18	Castelo Branco	10	8	M+L	29TPE20
	38	Covilha	4	3	M+L	29TPE25
	85	Fundao	2	2	M+L	29TPE24
	66	Pehnas de Saùde (Serra da Estrela)	8	8	MR, M+L	29TPE26
	135	Queijeiros (Serra da Estrela)	1	1	M	29TPE26
	19	Alpedrinha	10	7	M, M+L	29TPE42
Beira Litoral						
Aveiro	190	S. Jacinto	2	2	M	29TNF30
	146	Santa Luzia	4	4	M+L	29TNE46
Coimbra	117	Museu Zoologico da Coimbra (Aquarium)	1	1		29TNE55
	46	Cabril do Ceira (close to Coimbra)	11	6	M+L	29TNE54
	9	Coimbra	20	11	LA, M+L+Hep, M+L+Hep R, MAc, M+L, M+L A and R	29TNE45
	116	Jardim Botanico do Coimbra	1	1	Es	29TNE45
	10	Mealhada	9	4	LA, LR, M	29TNE46
	78	Penela (Serra do Carvahal)	9	5	M+L, M+L A and R	29TNE53
	106	Senhora da Piedade (Serra da Lousa)	4	2	LA, MR, M+L	29TNE64
	107	Serra do Buçaco	11	11	M	29TNE66
	49	Serra do Dianteiro (cerca de Coimbra)	2	2	M+L	29TNE45
	86	Serra do Espinal	1	1		29TNE53
	20	Serra do Estrela	12	7	M+L A and R, M+L+Hep	29TNE79
	79	Soure	7	3	LA, LR, M+L, M+L Aand R	29TNE33
Douro Litoral						
Porto	114	Amarante	36	19	L, LA, LR, M+L+Hep A and R, MA, MR, M+L, M+L Aand R	29TNF87
	212	Candemil	2	2	M+L	29TNF86
	152	Lixa	4	4	M+L	29TNF88
	115	Penafiel	7	6	ME, M+L	29TNF56
	189	Porto	4	2	M+L+Hep A and R	29TNF35
	11	Serra do Marao	10	6	M+L+Hep A and R, M+L, M+L Aand R, M	29TNF96
	157	Vallongo	12	7	M+L+Hep A and R, M+L, M+L, M+LA and R, M	29TNF46
Estremadura						
Leiria	211	Ile Berlenga	8	4	M+L Aand R	29SMD66
	168	Leiria	3	2	M+L+Hep A and R	29SND19
	147	Pontao	4	4	M+L	29SME52
	41	Sao Pedro de Moel	2	1	M+L+Hep A and R	29SME90
	133	Serra de Sicó	2	1	M+L	29SNE42
Minho						
Braga	150	Braga	3	3	M+L	29TNF49
	112	Caldas das Taipas	10	9	MR, M+L	29TNF69
	215	Escariz	2	2	M+L29TNG41	
Viana do Castelo						
	240	Fonte da Telha (Serra d' Arga)	1	1	M	29TNG23
	113	Ponte de Lima	7	6	MR, M+L	29TNG32
	39	Serra d' Arga	14	9	LA, LR, M+L+ Hep Aand R, MA, M+L, M+LA and R	29TNG23
Ribatejo						
Santarém	160	Abrantes	5	5	M+L	29SND66
	219	AlVega	3	3	M+L	29SND77
	165	Coruche	2	2	M+L	29SND41
	199	Entroncamonto	2	2	M+L	29SND46
	193	Vila Franca de Xira	5	2	M+L+Hep A and R, M+L, M+L R	29SND11
Tras os Montes e Alto Douro						
	214	Coçarelaos*1	2	2	M+L	
Bragaça	171	Sezulfe	4	4	M+L	29TPG70
	176	Bragança	2	2	M+L	29TPG83

Country / Autonomic Comunity (Spain) / Region (Portugal) / Province (Spain) / District (Portugal)	#Loc	Localities	#registers	#Spp	H-S types	UTM
	223	Milhao	2	2	M+L	29TPG03
	205	Miranda do Douro	2	2	M+L	29TQF29
	222	Mirandela	2	2	M+L	29TPF59
	224	Outeiro	2	2	M+L	29TQG01
	213	Passos	3	3	M+L	29TPF59
	225	Vinhais	2	3	M+L	29TPG63
Vila Real	207	Águas Frías	2	2	M+L	29TPG33
	151	Albergaria a Velha (Serra do Gerês)	10	9	L, M	29SNE93
	188	Alijó	4	2	M+L+Hep A and R	29TPF37
	138	Ansiaes	3	3	M+L	29TPF30
	196	Balsa	2	2	M+L	29TPF39
	153	Boticas	4	3	M+L	29TPG11
	169	Bouça	5	4	M+L	29TPG41
	206	Chaves	3	3	M+L	29TPG22
	194	Gerês	2	1	M+L+Hep A and R	29SNE93
	184	Grandais	3	3	M+L	29TPG40
	237	Justes	2	2	M+L	29TPF28
	154	Lamego	3	3	M+L	29TNF95
	180	Mondim de Basto	14	7	LA, LR, M+L+ Hep A and R, M+L A and R	29TNF88
	170	Murça	2	2	M+L	29TPF28
	173	Parada de Cuños	4	4	M+L	29TNF07
	177	Rebordelo	4	4	M+L	29TPG52
	216	Sabroso de Aguiar	2	2	M+L	29TPF10
	137	Sapiaes	6	6	M+L	29TPG42
	182	Sendim	4	4	M+L	29TPG54
	183	Vidago	5	5	M+L	29TPG11
	172	Vila Pouca de Aguiar	5	5	M+L	29TPF19
	120 b	Vila Real	4	4	M+L	29TPF07
	159	Vilarinho de Samarda	5	5	M+L	29TPF18
United Kingdom						
	245	Gibraltar	1	1		30STF80

Compiled data were analyzed with two non-parametric analyses, the Spearman correlation and Kruska-Wallis analysis, because data are not normally distributed, in order to locate the highest values of diversity from the studied area and to identify where we should concentrate sampling in future. The analysis were carried out with the STATISTICA 6.0 computer program.

Results

There are 737 works from all over the World on tardigrades, based on information from Zoological Record. Eighteen scientists elaborated 34 works on the Iberian Peninsula, Balearic Islands and Chafarinas Islands, over a period of 85 years. These articles have described one new genus to science, 10 species and 2 subspecies; only 6 of these works deal with marine tardigrades (Table I and II).

Table II presents tardigrade species found in the Iberian Peninsula, the Balearic Islands and Chafarinas Islands, ordered by class, order, family, genus and species. We have included information about synonymies found within these species, an identification number of localities where each species was found (Table III, Fig. 1), habitat-substratums sampled, article references, and where each species was cited for first time in the Iberian Peninsula.

In the bibliography dealing with the studied area, I found 112 species (in Table II appear 114 taxa but *Echiniscoides sigismundi hispaniensis* and *Echiniscoides sigismundi mediterraneus* are two subspecies, and *Macrobiotus dubius* is asigned as doubtfully species in Ramazzotti, 1972 page 548 and not appear in McInnes, 1994; so we have not taken into account in statistical analysis), 92 limnoterrestrial and 20 marine; 63.4% of all peninsular species have been found in Portugal, 78.5% in Spain, 11.8% in Andorra and 1.1% in Gibraltar (United Kingdom); 23 peninsular species occur only in Portugal, and 42 only in Spain (plus 14 Spanish species found only in Chafarinas Islands; Table II). There are no published works about marine tardigrades from Portugal. There are genera found only in Spain

(*Doryphoribius, Pseudobiotus, Astatumen, Richtersius, Cornechiniscus* and *Testechiniscus*) or found only in Portugal (*Hebesuncus, Itaquascon* and *Hypechiniscus*).

Table III lists localities of the studied area where tardigrades have been found, according to Country, Region (in Portugal) or Autonomic Community (in Spain) and District (in Portugal) or Province (in Spain). I have included identification locality numbers (which correspond to those on Fig. 1), UTM coordinates (when available and as precise as it was possible), number of registers (a register correspond to a record that differs from any other in at least one information field: taxonomical, geographical or/and autecological; it can offer a clue about sampling effort), number of species per locality and type of habitat-substratums studied in each locality where tardigrades occur.

Tardigrades have been found in 228 localities in the studied area (Table III); one is in Andorra, another is in Gibraltar (U. K.), 126 in Portugal and 100 in Spain. On Figure 1 a black point indicates each studied locality where tardigrades occur; each black point is numbered with the number assigned to each locality in Table III. It seems that there is a major concentration of points in Portugal, specially in the Northwest (Fig. 1), while in Spain the points are sparse, but become a bit denser in the Pyrenees and in the centre of Spain (mainly in Madrid).

In Table IV we show world-wide taxonomic category information on tardigrades found in the studied area. Section A shows the number of classes, orders, families, genera and species in the entire World and in the Iberian Peninsula; also included percentage of world species found in the Iberian Peninsula for each taxonomic category. This section also displays the number of genera and species found in Portugal and in Spain, genera and species that occur only in Spain or in Portugal and percentages according to world-wide information. Section B, displays number and percentage of species per family and per genera according to world-wide information, in the Iberian Peninsula and in the rest of the world.

We can observe that the world-wide pattern is repeated in the Iberian Peninsula. The world's most diverse families (Table IV), in species and genus number, that are also found in the Iberian Peninsula, are the most diverse families there too (i.e., for Hypsibiidae, 43% of genera and 11% of species occur in the Iberian Peninsula; Table IV). With reference to species number in the generea, the world's most diverse genera, that are also found in the Iberian Peninsula are also the most diverse genera there (Table IV).

Table V displays *p* values and Spearman correlation coefficients and Table VI *p* values from Kruskal-Wallis analysis and indicates the variables with the highest values for continuous variables analyzed. Two parallel analysis have been made, one with data collected from all habitat-substratums sampled in the Iberian Peninsula where tardigrades were found (Tables V and VIA), and another analysis with data only from mosses (Tables V and VIB), collected uniformly in points sampled in the Iberian Peninsula. Spearman correlation coefficients are qualitatively equal (always pisitive correlations and similar magnitudes), but vaules from analysis with mosses only are lower than those carried out over all habitats-substratums.

New records found in our samplings in the Iberian Peninsula are presented in Table II, which specifies class, order, family and genus of each species found. Synonymies found for each new species, identification number that corresponds with the numerical order on Table III and Figure 1 (new localities sampled in Iberian Peninsula, mainly from centre of Spain, are marked on Figure 1 with an "X"), UTM coordinates, habitat-substratums analyzed and number of specimens found for each species. New records for the Iberian Peninsula are: *Dactylobiotus parthenogeneticus*, *Dactylobiotus selenicus*, *Murrayon dianeae*, *Diphascon (Diphascon) nodulosum* (first record in Europe), *Diphascon (Diphascon) pingue* and *Isohypsibius marcellinoi*. These results increase the number of Tardigrada *phylum* species found in the Iberian Peninsula to 118, 5% more than the specific diversity previously known in the Iberian Peninsula.

There are broadly distributed limnoterrestrial species (large number of registers per species involving a large number of habitat-substratums and localities; Table V), appearing in Portugal and Spain in a large number of localities (Table II and III, Fig. 1), such as *Macrobiotus hufelandi* (130 localities) or *Milnesium tardigradum* (53 localities). The majority of these species are considered to be cosmopolitan by McInnes, in the revision made in 1994. However, there are other species with a more restricted distribution, appearing only in one locality (Table II and III; Fig. 1). The majority of species that are more or less widely distributed in the Iberian Peninsula appear in many of the habitat-substratums studied (i. e., *Macrobiotus hufelandi*) (Table II) with a high correlation coefficient (+0.81; Table V); but species that occur in many of the habitat-substratums studied do not

Table IV.— **(A)** Absolute number and percentage of limnoterrestrial species with respect to world-wide distribution of each Tardigrada taxonomy category in the World and in the Iberian Peninsula (IP). * = percentage with respect to world information; + = percentage with respect to Iberian Peninsula information; # = genus and species that appear only in Spain or in Portugal. **(B)** In the first part of the Table (left), number (No) and percentage (%) of limnoterrestrial genus and species (spp) with respect to World information in each of Tardigrada families found in the Iberian Peninsula (IP). In second part of the Table (right), number (No) and percentage (%) of limnoterrestrial species (spp) with respect to World information in each of the Tardigrada genus found in the Iberian Peninsula.

Tabla IV.— **(A)** Número absoluto y porcentaje de especies limnoterrestres respecto a la distribución mundial de cada categoría taxonómica del *phylum* Tardigrada en el Mundo y en la Península Ibérica (IP). * = porcentaje respecto a la información mundial; += porcentaje respecto a la información peninsular; # = géneros y especies que aparecen sólo en España o en Portugal. **(B)** En la primera parte de la Tabla (izquierda), número (No) y porcentaje (%) de géneros y especies (spp) limnoterrestres respecto a la información mundial de cada familia del *phylum* Tardigrada encontrada en la Península Ibérica (IP). En la segunda parte de la Tabla (derecha), número (No) y porcentaje (%) de especies limnoterrestres recpecto a la información mundial de cada género del *phylum* encontrado en la Península Ibérica.

(A)

Taxonomic categories↓	Absolute number of each taxonomic category				Percentage of species (%)		
	World	IP	Spain	Portugal	IP*	Spain+	Portugal+
Class	3	2	2	2	66.7	100	100
Order	5	3	3	3	60.0	100	100
Family	20	5	5	5	25.0	100	100
Genus	57	23	19 (4#)	18 (4#)	40.4	19.8 (4.2#)	18.8 (4.2#)
Species	783	92	72 (35#)	59 (23#)	11.7	78.3 (38.0#)	57.4 (24.0#)

(B)

Families↓	Genus and Species per Family World (Number)		Iberian Peninsula				Species per Genus			
	Genus / Family	Species /Family	Genus / Family		Spp / Family		Genus↓	World	IP	
			No	%	No	%		No	No	%
Milnesiidae	2	7	1	50.0	1	14.3	***Milnesium***	1	1	100.0
Calohypsibiidae	4	16	1	25.0	3	18.8	***Calohypsibius***	4	3	75.0
Hypsibiidae	21	295	9	42.9	32	10.8	***Astatumen***	5	1	20.0
							Diphascon	77	9	11.7
							Doryphoribius	16	2	12.5
							Hebesuncus	3	1	33.3
							Hypsibius	39	7	18.0
							Isohyosibius	117	9	7.6
							Itaquascon	7	1	14.3
							Pseudobiotus	4	1	25.0
							Ramazzottius	18	2	11.1
Macrobiotidae	11	197	5	45.5	25	12.7	***Dactylobiotus***	10	3	30.0
							Macrobiotus	142	17	12.0
							Minibiotus	23	3	13.0
							Murrayon	7	2	28.6
							Richtersius	1	1	100.0
Echiniscidae	12	235	7	58.3	32	13.6	***Bryodelphax***	11	3	27.3
							Cornechiniscus	9	2	22.2
							Echiniscus	151	16	10.6
							Hypechiniscus	6	1	16.7
							Parechiniscus	2	2	100.0
							Pseudechiniscus	35	5	14.3
							Testechiniscus	6	1	16.7

Table V.— Spearman correlation analysis results. Spearman coefficient (R) and p values from significant correlation analysis between pairs of variables and per species, genus, habitats and localities specified in each case. No = number, HS = habitat-substratums.

Tabla V.— Resultados del análisis de correlación de Spearman. Coeficiente de Spearman (R) y valores de p para los análisis de correlación significativos entre pares de variables y por especie, género, hábitat y localidad especificado en cada caso. No = número, HS = habitat-sustrato.

	All Habitat-Substratums		Only with Mosses	
Pairs of Variables analyzed	**p value**	**R**	**p value**	**R**
No Species with No Registers per locality	0.00	+ 0.95	0.00	+ 0.93
No Species with No HS per locality	0.00000	+ 0.38	0.000007	+ 0.33
No Species with No Localities per region	0.00033	+ 0.52	0.039	+ 0.37
No Species with No Register per region	0.000000	+ 0.94	0.000000	+ 0.90
No Genus with No Registers per locality	0.000000	+ 0.87	0.000000	+ 0.84
No Genus with No HS per locality	0.000000	+ 0.43	0.000000	+ 0.40
No Genus with No Localities per region	0.000003	+ 0.65	0.023	+ 0.40
No Genus with No Register per region	0.000000	+ 0.89	0.000000	+ 0.79
No HS with No Register per species	0.000000	+ 0.81	0.000000	+ 0.69
No HS with No Register per locality	0.000000	+ 0.52	0.000000	+ 0.48
No HS with No Localities per region	0.000077	+ 0.57	0.0011	+ 0.55
No Localities with No HS per species	0.000000	+ 0.81	0.000000	+ 0.69
No Localities with No Registers per HS	0.000000	+ 0.98	0.000000	+ 0.98
No Localities with No Registers per region	0.000000	+ 0.90	0.000000	+ 0.85
No Registers with No Localities per species	0.00	+ 0.98	0.00	+ 0.93

have to be widely distributed in the Iberian Peninsula (i.e., *Macrobiotus harsmworthi* is not widely distributed in the Iberian Peninsula but occurs in the majority of habitats sampled in the Iberian Peninsula; Table II).

Mosses plus lichens are the habitats with the highest tardigrade species specific and genera diversity (Table II, VIA and B), but the greatest extensive sampling effort (number of localities) have been made too in these habitats (Tables VIA and B). Similar situation is in leaf-litter (Table VIA). While considerable sampling effort has been directed towards certain habitats (such as mosses; Table VIB), others have been greatly overlooked and a lot of habitats in the Iberian Peninsula where tardigrades can live have been not sampled at all (i.e., interstitial habitats in caves; Table II) or else insufficiently (marine habitats that have high species diversity without a great sampling effort associated), as demonstrated by new sampling (Table III). These habitats seem to have new tardigrade species to add to the previously known Iberian Tardigrada diversity (Table II). While there are species restricted to few habitat-substratums, this does not mean that a specific species-habitat relationship exists. It could be that in some localities few or rare habitat-substratums were sampled and the relationship would then be between locality-species instead of habitat-species. To verify the existence of a true species-habitat relationship, further studies are required.

With reference to localities, of the few (Tables II and III) populated by 10 or more species, one is in Andorra (number of locality: 29), one in Spain (13) and 7 in Portugal (43, 25, 139, 40, 9, 107, 114), with the majority in Northwest Portugal (Fig. 1). These localities are characterised by the highest number of registers and number of sampled habitat-substratums (Table V). The results for genera are the same (Table V). The greatest sampling effort has been made in Portugal, both in locality number (55.3% from total) and in register number (68.1% from a total of 1020 registers) (Table III). Nevertheless, the highest percentages of limnoterrestrial species and genera in the Iberian Peninsula were found in Spain (78.3% and 82.6%, respectively) (Table II).

Discussion

Articles about Iberian tardigrade studies have appeared irregularly, and do not lend themselves to a global statistical analysis due to bias in geograp-

Table VI.— Kruskal-Wallis analysis results from analysis of all habitat (A) and only of mosses (B): p values (significant) and greatest values for type of habitat-substratums; the first column is the continuous variable analysed with the type of habitat substratum (discrete variable). No= number, HS= habitat-substratums, AM= marine algae, H= leaf-litter, IM= interstitial marine habitats, M= moss, MA= moss from trunks, MDulc= moss from freshwater, ME= moss from soil, ML= moss+lichens, MR= moss from rocks, MLA= moss+lichens from trunks, MLR= moss+lichens from rocks , MLHep= moss+lichens+hepatics, MLHEPDV= moss+lichens+ hepatics+detritus, MLHepA= moss+lichens+hepatics from trunks, MLHepR= moss+lichens+hepatics from rocks, SM= marine sediment, TUR= peatland.

Tabla VI.— Resultados del análisis de Kruskal-Wallis analysis para el análisis con todos los hábitats (A) y sólo con musgo (B): valores de p (significativos) y qué hábitats-sustratos tiene los valores más altos; la primera columna es la variable contínua analizada con el tipo de hábitat sustrato (variable discreta). No= número, HS= hábitat-sustrato, AM= alga marina, H= hojarasca, IM= hábitat intersticial marino, M= musgo, MA= musgo arborícola, MDulc= musgo dulceacuícola, ME= musgo edáfico, ML= musgo+líquen, MR= musgo rupícola, MLA= musgo+líquen arborícola, MLR= musgo+líquen rupícola, MLHep= musgo+líquen+hepática, MLHEPDV= musgo+líquen+hepática+detritus, MLHepA= musgo+líquen+hepática arborícola, MLHepR= musgo+líquen+hepática rupícola, SM= sedimentos marinos, TUR= turbera.

(A)	All Habitat-Substratums	
Continuous variables	**p**	**Biggest values for continuos variables**
No Species per region	0.007	ML>SM>H>M>MLA
No Genus per region	0.004	ML>H>MLA>M>MLR>SM>MA
No Localities per region	0.001	ML>H>MLA>M>MLHEPA

(B)	Only with Mosses	
Continuous variables	**p**	**Biggest values for continuos variables**
No Species per region	0.006	ML>MLA>M>MLR>MR>MA>ME>MLHEPR>MLHEPA
No Genus per region	0.006	ML>MLA>M>MLR>MA>MR>MDULC
No Localities per region	0.019	ML>M=MLHEPA=ME>MLA>MLHEPR>MR>MLR>MA

hical location of sampling points and in the analyzed habitats. Anyway, increasing sampling effort (extensively (in number of localities), intensively (in number of registers) or in habitats sampled) more specific and generic diversity has been found in the Iberian Peninsula (Table V).

It seems that the species diversity of some habitats may be greater than others; i.e., moss and lichen assemblages seem to be the most diverse habitats (Table II), thought they are also the most sampled (in 55.2% of the localities). When the Iberian Peninsula is considered as a geographic whole it becomes evident that major differences in habitat sampling are due more to sampling behaviour than to absence of habitat (mosses, lichens or soil are found almost anywhere in the Iberian Peninsula). Future research could thus focus on the relationship between tardigrade diversity and habitat type.

There are 1.2 times more species found in Spain than in Portugal, but there are 1.3 times more localities sampled in Portugal than in Spain. Species diversity of Tardigrada *phylum* seems greater in Spain than in Portugal, but this situation should be studied further. Species diversity may be due to the greater number of habitats sampled in Spain (for instance, there are no works on Portuguese marine tardigrades). The main geographic difference between the two countries is their surface areas, the Spanish surface area is 5.5 times larger than the Portuguese (89,743 km^2 *vs.* 504,750 km^2). On the other hand, Andorra, with a surface area of 468 km^2, has the highest species diversity in relation with its surface area: 11 tardigrade species from 7 genera from 2 references (see Table III). Sampling effort should be directed towards increasing habitat diversity sampled, because its extencion seems to be positively related with species and genus diversity (Table V). Also the geographic areas of study should be increased to determine which species are cosmopolitan and to verify if Iberian endemisms exist.

If the aims previously indicated will be achieved, Spanish Tardigrada *phylum* studies will ideally be, one day, as complete as those conducted in Portugal, both in the extension and intensity of the sampling. As it seens in results obtained in this work, tardigrade species diversity in Spain is found to be high. The great variety and diversity of

Spanish landscapes and habitats along with its unique geological history could favour the discovery of new species to science. The greater species diversity would then be of interest to a further approach to systematics and conservation.

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