

Data to the Tardigrada fauna of Albania

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ABSTRACT: Author describes the Tardigrada species detected from 33 moss and 1 lichen samples from Albania. The 59% of the samples contained tardigrades, of which 30 species were detected. Most of the species are xerophilous and eurytopic. The similarity of the Tardigrada species originated from Albanian samples and of the nearby Bulgarian tardigrade fauna is 52%.

Introduction

The phylum Tardigrada contains more than 1100 described species of cosmopolitan microscopic invertebrates found in diverse habitats within terrestrial, freshwater and marine environments. We have a very incomplete knowledge about the Tardigrada fauna of Albania. The Register of Species of the Fauna of Albania (DHORA 2010) marks only one Tardigrada species (*Macrobotus ovidii* Bartoš, 1937) without locality and source. There are no incidence data about further limno-terrestrial species. DE ZIO GRIMALDI & GALLO D'ADDABBO (2001) reported from 1 marine species (*Batillipes pennaki* Marcus, 1946) in the intertidal zone of the Albanian coast, near Durrës.

Materials and methods

Tardigrades described in this work originate from moss and lichen samples collected during collector roads realized under the long-term Balkan research project of the Hungarian Natural History Museum. Dr. Zoltán FEHÉR was kind to make samples available for the tardigrade investigations. 33 moss and 1 lichen species were investigated altogether, of which 19 moss and 1 lichen samples were proved to be positive for tardigrade. The positive samples were collected from the undermentioned locations (Fig. 1).

The extraction of tardigrades from air-dry samples occurred after a 24 hour soak in tap water in Petri dish. The detailed description of the method [soaking-washing-filtration-sedimentation and flotation by centrifugation] was published in VARGHA et al. (2002) work. The search and picking of the specimens and eggs occurred by stereo microscope (magnification: 25–50 times). Tardigrade specimens and eggs were mounted on microscopic slides, preserved in polyvinyl – lactophenol, determination of the species by microscope (magnification 400–900 times). Species were determined first of all on the basis of work of DASTYCH (1988) and RAMAZZOTTI & MAUCCI (1983). Microscopic preparations are preserved in the author's collection.

Sampling sites in Albania (Fehér et al. 2004)

1992/221/a Periferi Krujë, Krujë, castle ruins (600 m a.s.l.) [limestone walls] DL09, 13.09.1992. leg.: Fehér, Z., moss from rock

1992/222 Periferi Krujë, Mali i Krujës, over Krujë (800–1000 m a.s.l.) [limestone rocks] DL09, 13.09.1992. leg.: Fehér, Z., moss from rock

1992/224 Periferi Tiranë, Tiranë, city park, at the artificial lakelet [lacustrine drift, among leaf-litter] DL07, 14.09.1992. leg.: Fehér, Z., moss

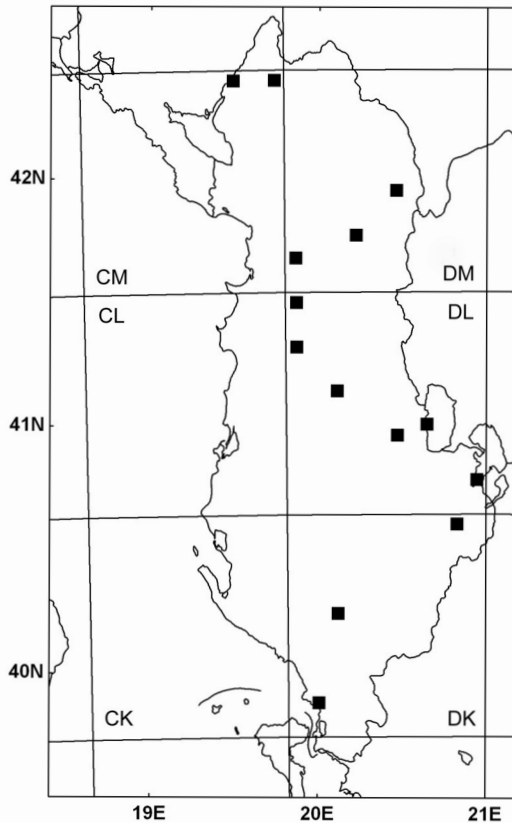


Fig. 1. Tardigrade positive sampling sites in Albania by Zoltán Fehér

1992/224/b Periferi Korçë, Mali i Moravës, E of Korçë [pine forest plantation] DK89, 17.09.1992. leg.: Fehér, Z., moss

1992/226 Periferi Korçë, Liqenas, by the shore of Liqeni i Prespes [lacustrine drift, degraded ruderal vegetation] DL91, 18.09.1992. leg.: Fehér, Z., moss

1993/302/a Periferi Mat, Ulëz, around the village and by the shore of Liqeni i Ulëzes [secondary shrub vegetation] DM01, 17.07.1993. leg.: Fehér, Z., moss from stone

1993/303 Periferi Mat, Mali i Dejës, along the road from Qafa e Murrës to Liqeni i Lulevës, DM31 or DM32, 18.07.1993. leg.: Fehér, Z., moss from stone, lichen from tree (This sampling site was mentioned by FEHÉR et al. (2004) as “Shkëmb i Skanderbeut, W of Kurbnesh”, however, this definition was based on a misunderstanding and therefore incorrect. The sample was collected south of the Liqeni i Luleves, but collector is unable to define it more precisely – Fehér, Z. personal communication, 2011.)

1993/303/a Periferi Dibrë, SW of Fushë-Lurë, Liqeni i Lulevës [peat-bog, natural pine forest] DM32, 18.07.1993. leg.: Fehér, Z., moss from tree

1993/305 Periferi Pogradec, Lin, by the shore of Liqeni i Ohrit (710 m a.s.l.) [limestone rocks] DL74, 21.07.1993. leg.: Fehér, Z., moss from stone

1993/312 Periferi Tiranë, Mali i Dajtit, Linzë, 1 km towards the peak [in an olive grove, under stones] DL07, 27.07.1993. leg.: Fehér, Z., moss from stone

1993/314 Periferi Sarandë, Sarandë, beach [limestone rocks] DK11, 25.07.1993. leg.: Fehér, Z., moss from stone

1993/316 Periferi Tepelenë, 7 km S of Tepelenë, Uji i Ftohtë [limestone rocks near the waterfall] DK25, 26.07.1993. leg.: Fehér, Z., moss from stone

- 1994/452** Periferi Krujë, Mali i Krujës, over Krujë (800–1000 m) [limestone rocks] DL09, 14.09.1994. leg.: Fehér, Z. & Kónya, P., moss from stone
- 2003/022** Periferi Kukës, Bicaj, gorge of the Pr. i Tershanës (500 m) [in/near the brook, limestone rocks] DM54, 25.06.2003. leg.: Eröss, Z., Fehér, Z., Kontschán, J., Murányi, D., moss
- 2003/033** Periferi Mat, in the gorge of Lumi i Matit, along the Burrel – Milot main road, 11 km W of the conjunction to Ulëz (100 m) [limestone rocks, in/near the river] DM01, 27.06.2003. leg.: Eröss, Z., Fehér, Z., Kontschán, J., Murányi, D., moss
- 2003/046** Periferi Elbasan, Shushicë, Burimi te Byshekut (175 m) [in/near the spring, limestone rocks] DL25, 30.06.2003. leg.: Eröss, Z., Fehér, Z., Kontschán, J., Murányi, D., moss
- 2003/057** Periferi Pogradec, Shpellë (4 km SW of Bishnicë), Shkemb i Qytetit (1140 m) [limestone and conglomerate rocks] DL53, 01.07.2003. leg.: Eröss, Z., Fehér, Z., Kontschán, J., Murányi, D., moss
- 2003/084** Periferi Malësia, Qafa e Pejës, N of Okol (1700 m) [limestone rocks, subalpine meadow] CM99, 06.07.2003. leg.: Eröss, Z., Fehér, Z., Kontschán, J., Murányi, D., moss
- 2003/088** Periferi Malësia, a mountain pass, 2 km N of Raps along the road from Hani i Hotit to Vermosh (760m) [limestone rocks] CM79, 07.07.2003. leg.: Eröss, Z., Fehér, Z., Kontschán, J., Murányi, D., moss

Results

The 59% of all (34) samples contained tardigrades. Altogether 30 Tardigrada species were detected from the 19 moss and 1 lichen samples. Most of the species are xerophyllous and eurytopic. The most frequent species are: *Macrobotus hufelandi hufelandi* C. A. S. Schultze, 1833 – 9 samples, *Paramacrobotus richtersi* (Murray, 1911) – 7 samples, *Echiniscus granulatus* (Doyère, 1840) – 6 samples. The 43% of the species were found only in 1-1 sample. The most species-rich sampling sites were: 1993/305 (11 species), 1993/303 (10 species) and 1994/452 (9 species). The 35% of the samples contained only the specimens of 1-1 species. The occurrence of more Tardigrada species is expectable by the investigation of further moss, lichen, litter and soil samples from newer, primarily shady, moist areas. The sampling sites of the different Tardigrada species and the occurrence of the Tardigrada species on the different sampling sites is the following.

Sampling sites of the Tardigrada species

- Echiniscus blumi blumi* Richters, 1903 – 1993/303
- Echiniscus canadensis* Murray, 1910 – 1993/303
- Echiniscus granulatus* (Doyère, 1840) – 1992/222, 1992/224/b, 1992/226, 1993/302/a, 1993/316, 2003/084
- Echiniscus mediantus* Marcus, 1930 – 1993/303
- Echiniscus merokensis merokensis* Richters, 1904 – 1993/302/a, 1993/303/a
- Echiniscus merokensis suecicus* Thulin, 1911 – 1993/302/a
- Echiniscus spinulosus* (Doyère, 1840) – 1993/305
- Echiniscus testudo* (Doyère, 1840)
- f. quadrifilis – 1993/305, 1993/316, 2003/088
- f. trifilis – 1992/226, 1993/305, 1994/452, 2003/088
- Echiniscus trisetosus* Cuénot, 1932 – 1993/303
- Pseudechiniscus suillus* (Ehrenberg, 1853) – 1993/303, 1993/303/a, 1994/452, 2003/057
- Milnesium tardigradum tardigradum* Doyère, 1840 – 1993/303, 1993/312
- Diphascon (Diphascon) bullatum* Murray, 1905 – 1993/316
- Diphascon (Diphascon) pingue pingue* (Marcus, 1936) – 1993/302/a
- Diphascon (Diphascon) recamieri* Richters, 1911 – 1993/303
- Diphascon (Adropion) prorsirostre* Thulin, 1928 – 2003/057

Hypsibius convergens (Urbanowicz, 1925) – 1992/222, 1993/302/a, 1993/305, 1994/452
Hypsibius dujardini (Doyère, 1840) – 1992/224, 1993/312
Astatumen trinacriae (Arcidiacono, 1962) – 1994/452
Ramazzottius anomalus (Ramazzotti, 1962) – 1992/224/b, 1993/303, 1994/452
Isohypsibius pappi (Iharos, 1966) – 1993/302/a
Isohypsibius prosostomus prosostomus Thulin, 1928 – 1992/222
Isohypsibius silvicola (Iharos, 1966) – 1992/226
Macrobiotus harmsworthi harmsworthi Murray, 1907 – 1992/222, 1993/302/a, 1993/305
Macrobiotus hufelandi hufelandi C. A. S. Schultze, 1833 – 1992/222, 1992/226, 1993/302/a, 1993/303/a, 1993/305, 2003/022, 2003/033, 2003/046, 2003/057
Macrobiotus islandicus islandicus Richters, 1904 – 1992/222, 1993/305, 1994/452
Macrobiotus macrocalix Bertolani & Rebecchi, 1993 – 1993/303, 1993/303/a
Macrobiotus ovidii Bartoš, 1937 – 1992/221/a, 1993/305, 1994/452
Minibiotus intermedius (Plate, 1888) – 1993/303/a, 1993/305, 1994/452, 2003/057
Paramacrobiotus areolatus (Murray, 1907) – 1993/303, 1993/305, 1993/314, 1993/316,
Paramacrobiotus richtersi (Murray, 1911) – 1992/224, 1992/224/b, 1992/226, 1993/302/a, 1993/305, 1994/452, 2003/057
Richtersius coronifer (Richters, 1903) – 1993/305

Occurrence of the Tardigrada species on the different sampling sites

1992/221/a: *Macrobiotus ovidii* – **1992/222:** *Echiniscus granulatus*, *Hypsibius convergens*, *Isohypsibius prosostomus prosostomus*, *Macrobiotus harmsworthi harmsworthi*, *M. hufelandi hufelandi*, *M. islandicus islandicus* – **1992/224:** *Hypsibius dujardini*, *Paramacrobiotus richtersi* – **1992/224/b:** *Echiniscus granulatus*, *Ramazzottius anomalus*, *Paramacrobiotus richtersi* – **1992/226:** *Echiniscus granulatus*, *E. testudo* f. *trifilis*, *Isohypsibius silvicola*, *Macrobiotus hufelandi hufelandi*, *Paramacrobiotus richtersi* – **1993/302/a:** *Echiniscus granulatus*, *E. merokensis merokensis*, *E. merokensis sueticus*, *Diphascion (Diphascion) pingue pingue*, *Hypsibius convergens*, *Isohypsibius pappi*, *Macrobiotus harmsworthi harmsworthi*, *M. hufelandi hufelandi*, *Paramacrobiotus richtersi* – **1993/303 in moss:** *Echiniscus blumi blumi*, *E. canadensis*, *E. mediantus*, *E. trisetosus*, *Pseudechiniscus suillus*, *Milnesium tardigradum tardigradum*, *Macrobiotus macrocalix*, *Paramacrobiotus areolatus*; **in lichen:** *Echiniscus canadensis*, *E. trisetosus*, *Diphascion (Diphascion) recamierei*, *Ramazzottius anomalus*, *Macrobiotus macrocalix* – **1993/303/a:** *Echiniscus merokensis merokensis*, *Pseudechiniscus suillus*, *Macrobiotus hufelandi hufelandi*, *M. macrocalix*, *Minibiotus intermedius* – **1993/305:** *Echiniscus spinulosus*, *E. testudo* f. *quadrifilis*, f. *trifilis*, *Hypsibius convergens*, *Macrobiotus harmsworthi harmsworthi*, *M. hufelandi hufelandi*, *M. islandicus islandicus*, *M. ovidii*, *Minibiotus intermedius*, *Paramacrobiotus areolatus*, *P. richtersi*, *Richtersius coronifer* – **1993/312:** *Milnesium tardigradum tardigradum*, *Hypsibius dujardini* – **1993/314:** *Paramacrobiotus areolatus* – **1993/316:** *Echiniscus granulatus*, *E. testudo* f. *quadrifilis*, *Diphascion (Diphascion) bullatum*, *Paramacrobiotus areolatus* – **1994/452:** *Echiniscus testudo* f. *trifilis*, *Pseudechiniscus suillus*, *Hypsibius convergens*, *Astatumen trinacriae*, *Ramazzottius anomalus*, *Macrobiotus islandicus islandicus*, *M. ovidii*, *Minibiotus intermedius*, *Paramacrobiotus richtersi* – **2003/022:** *Macrobiotus hufelandi hufelandi* – **2003/033:** *Macrobiotus hufelandi hufelandi* – **2003/046:** *Macrobiotus hufelandi hufelandi* – **2003/057:** *Pseudechiniscus suillus*, *Diphascion (Adropion) prorsirostre*, *Macrobiotus hufelandi hufelandi*, *Minibiotus intermedius*, *Paramacrobiotus richtersi* – **2003/084:** *Echiniscus granulatus* – **2003/088:** *Echiniscus testudo* f. *quadrifilis*, f. *trifilis*.

Tardigrada species originated from the Albanian samples show great similarity to the Tardigrada fauna of the nearby Bulgaria. More than the half of the 35 Tardigrada species published from Bulgaria (IHAROS 1961, 1973, 1982, KACZMAREK et al. 2011) and the 30 species detected from Albanian samples are the same (QS% = 52,3).

The taxonomic classification of the Tardigrada species originated from the Albanian samples according to the newest published lists (DEGMA & GUIDETTI 2007, DEGMA et al. 2009–2011, GUIDETTI & BERTOLANI 2005) is the following.

Tardigrada species from Albania

HETEROTARDIGRADA Marcus, 1927

ECHINISCOIDEA Richters, 1926

Echiniscidae Thulin, 1928

Echiniscus C.A.S. Schultze, 1840

Echiniscus blumi blumi Richters, 1903

Echiniscus canadensis Murray, 1910

Echiniscus granulatus (Doyère, 1840)

Echiniscus mediantus Marcus, 1930

Echiniscus merokensis merokensis Richters, 1904

Echiniscus merokensis suecicus Thulin, 1911

Echiniscus spinulosus (Doyère, 1840)

Echiniscus testudo (Doyère, 1840)

Echiniscus trisetosus Cuénot, 1932

Pseudechiniscus Thulin, 1911

Pseudechiniscus suillus (Ehrenberg, 1853)

EUTARDIGRADA Richters 1926

APOCHELA Schuster, Nelson, Grigarick & Christenberry, 1980

Milnesiidae Ramazzotti, 1962

Milnesium Doyère, 1840

Milnesium tardigradum tardigradum Doyère, 1840

PARACHELA Schuster, Nelson Grigarick & Christenberry, 1980

Hypsibiodea Pilato, 1969

Hypsibiidae Pilato, 1969

Diphasconinae Dastych, 1992

Diphascon (*Diphascon*) Plate, 1888

Diphascon (*Diphascon*) *bullatum* Murray, 1905

Diphascon (*Diphascon*) *pingue pingue* (Marcus, 1936)

Diphascon (*Diphascon*) *recamieri* Richters, 1911

Diphascon (*Adropion*) Pilato, 1987

Diphascon (*Adropion*) *prorsirostre* Thulin, 1928

Hypsibiinae Pilato, 1969

Hypsibius Ehrenberg, 1848

Hypsibius convergens (Urbanowicz, 1925)

Hypsibius dujardini (Doyère, 1840)

Itaquisconinae Rudescu, 1964

Astatumen Pilato, 1997

Astatumen trinacriae (Arcidiacono, 1962)

Ramazzottidae Marley, McInnes & Sands, 2011

Ramazzottius Binda & Pilato, 1986

Ramazzottius anomalus (Ramazzotti, 1962)

Isohypsibiodea Marley, McInnes & Sands, 2011

Isohypsibiidae Marley, McInnes & Sands, 2011

Isohypsibius Thulin, 1928

Isohypsibius pappi (Iharos, 1966)

Isohypsibius prosostomus prosostomus Thulin, 1928

Isohypsibius silvicola (Iharos, 1966)

Macrobotoidea Marley, McInnes & Sands, 2011

Macrobotidae Thulin, 1928

Macrobotus C. A. S. Schultze, 1834

Macrobotus harmsworthi harmsworthi Murray, 1907

Macrobotus hufelandi hufelandi C. A. S. Schultze, 1833

Macrobotus islandicus islandicus Richters, 1904

Macrobiotus macrocalix Bertolani & Rebecchi, 1993
Macrobiotus ovidii Bartoš, 1937
Minibiotus R. O. Schuster, 1980
Minibiotus intermedius (Plate, 1888)
Paramacrobiotus Guidetti, Schill, Bertolani, Dandekar & Wolf, 2009
Paramacrobiotus areolatus (Murray, 1907)
Paramacrobiotus richtersi (Murray, 1911)
Richtersius Pilato & Binda, 1989
Richtersius coronifer (Richters, 1903)

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