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Annotated zoogeography of non-marine Tardigrada. Part IV: Africa

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Abstract

This paper is the fourth monograph in a series that describes the global records of limno-terrestrial water bears (Tardigrada). Here, we provide a comprehensive list of non-marine tardigrades recorded from Africa, providing an updated and revised taxonomy accompanied by geographic co-ordinates, habitat, and biogeographic comments. It is hoped this work will serve as a reference point and background for further zoogeographical and taxonomical studies.

Key words: biogeography, species list, tardigrades, taxonomy

Introduction

Whilst often referred to as one of the ‘minor’ or ‘lesser known’ phyla, the Tardigrada comprises a group of animals with an almost ubiquitous worldwide distribution. These micro-metazoans have a range of 100–2000 µm with an average of 500 µm as mature adults. Tardigrades are bilaterally symmetrical with five distinct ‘pseudosegments’: the head and four body segments, each bearing a pair of lobopod limbs most often terminated with claws. They are found in a variety of habitats from tropical rain forests to arid polar deserts, and from mountain tops to the abyssal ocean depths.

Tardigrades were first described in the 18th Century, with 19th and early 20th Century work focusing on taxonomy and ecology, while late 20th early and 21st Century studies build on the earlier studies and explore the tardigrades anabiotic adaptations (e.g. Welnicz *et al.* 2011). The early work was largely based on morphology with few physiological studies and latterly more discussion on evolutionary and systematic status. Recently, revisions of the Parachela have focused on higher subdivisions (Marley *et al.* 2011), and families (Pilato & Binda 2010), while there have been a number of revisions to ‘species complexes’, with an increasing emphasis on molecular data (e.g. Bertolani & Rebecchi 1993; Claxton 1998; Guidetti *et al.* 2000; Guidetti & Bertolani 2001a; Jørgensen & Kristensen 2004; Guidetti *et al.* 2005; Jørgensen *et al.* 2011; Michalczyk *et al.* 2012a; 2012b; Gąsiorek *et al.* 2016). The monographs by Ramazzotti (1962a; 1972; 1974) with the final edition III (Ramazzotti and Maucci 1983) and its English translation (Beasley 1995) are still the main starting point for most taxonomic studies on tardigrades. However, it should be noted that the data in the monographs are dated and users would be advised to check original and modern literature for species diagnosis, current taxon names and distribution. A checklist of the known tardigrade taxa (Guidetti & Bertolani 2005; Degma & Guidetti 2007) is regularly updated (Degma *et al.* 2009–2016), and there is also a new online tardigrade taxonomy data repository, ‘the Tardigrada Register’ (Michalczyk & Kaczmarek 2013).

The first global biogeographic synthesis of non-marine tardigrades (McInnes 1994) provided limited species bio-distribution ranges within the confines of geopolitical borders, but remains the starting point for all subsequent studies on any aspect of taxonomy and biogeography. These baseline data have increased by over 70%, while distribution data can now be pinpointed to less than a degree of latitude and longitude. This literature and data explosion of the last two decades has prompted us to embark on an updated and enriched biogeography of the Tardigrada. The sheer quantity of data necessitates that this will be published as a series of nine papers, covering: Central America, South America, North America, Antarctica, Europe, Africa, Asia, Australia, and Oceanic Islands. Each paper will be defined in detail with this, the fifth section, being the non-marine tardigrades of Africa (Figs 1–2).

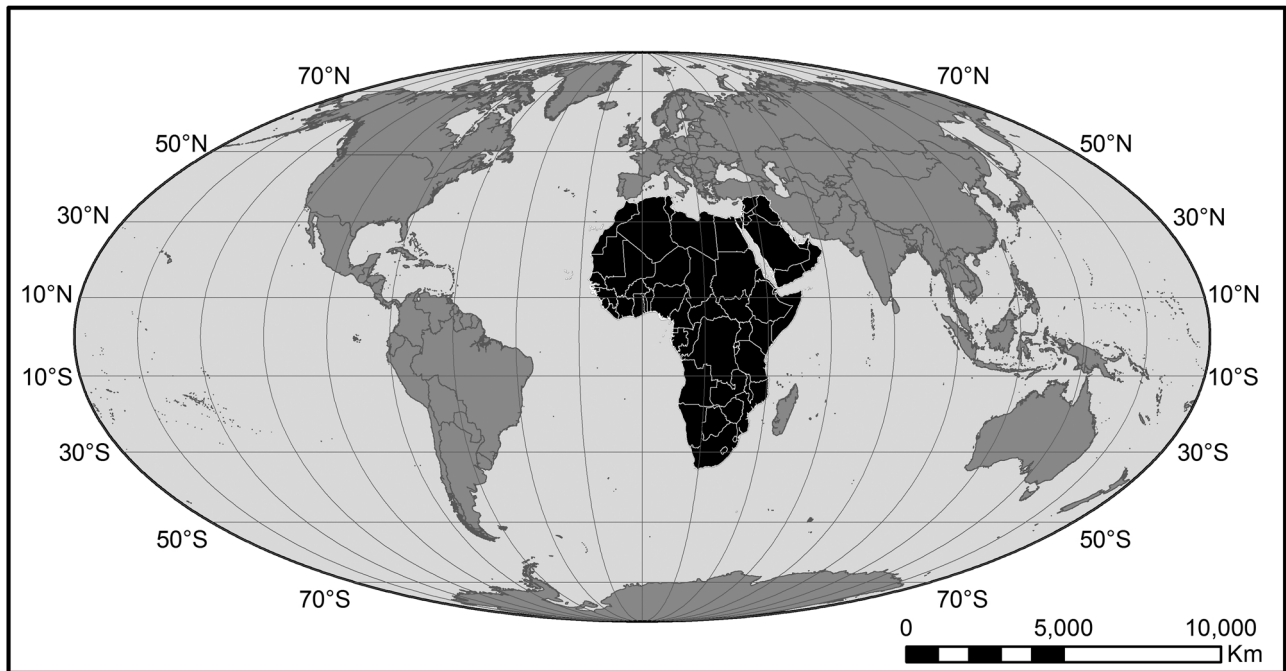


FIGURE 1. World map with Africa and the Arabian Peninsula marked in black.

Materials and methods

Definition of Africa. We are obliged to adopt geopolitical boundaries used to define the major geopolitical regions. We define Africa as the tectonic (continental) African and Arabian Plate, which share a Gondwanan origin (McClusky, *et al.* 2003; Stern & Johnson 2010). The dividing line becomes the geopolitical boundaries of Syria-Turkey and Iraq-Iran (ca. 35°55'N, 35°54'E to 37°08'N, 44°44'E to 30°00'N, 48°30'E).

A part of the Gondwanan supercontinent, Africa (comprising the Nubia and Somali plates) became separated from South America, Antarctica and Australasia during the Jurassic to Early Cretaceous about 145–130 Mya, moving northwards with the Arabian plate (Arabian Peninsula), to collide, along the northern edge, with the Eurasian Plate (Scotese 2002). Africa, the second largest continent, straddles the equator and is divided into five geographic sub-regions, which comprise 48 countries (and six island states (including Madagascar) that will be discussed in a later volume). Two biogeographic realms divide Africa. The Palearctic ecozones to the north includes: temperate coniferous forests, flooded grasslands and savannas, montane grasslands and shrublands, mediterranean forests, woodlands, and scrub, and deserts and xeric shrublands. Separated by the Saharan and Arabian deserts the Afrotropic ecozones to the south includes: tropical and subtropical moist broadleaf forests, tropical and subtropical dry broadleaf forests, tropical and subtropical grasslands, savannas, and shrublands, temperate grasslands, savannas, and shrublands, flooded grasslands and savannas, montane grasslands and shrublands, Mediterranean forests, woodlands, and scrub, deserts and xeric shrublands, and mangrove (UNEP 2008).

Literature database. The literature database incorporates McInnes (1994), the earlier literature not available in that publication, and subsequently published papers up to 01.03.2017. As this series provides geographical coordinates and habitat information, we feel we are justified in incorporating all published records.

List format for the Africa species records. The higher taxonomic details to valid genera, species, subspecies (and synonyms) are listed in italics with authority in accordance with the current revision of the Eutardigrada (Bertolani *et al.* 2014) and the tardigrade checklist (Degma *et al.* 2009–2016). Taxonomy is followed by a code indicating currently known habitat preference (e.g. terrestrial or freshwater). *Sensu lato* is used where there is doubt about the identifications with explanations provided under 'Remarks'.

Immediately below the valid species name is a list of synonyms, misidentifications, literature errors (e.g. partial names, typographic anomalies, wrong dates, etc.), and original names prior to taxonomic amendment (e.g. generic reassignment).

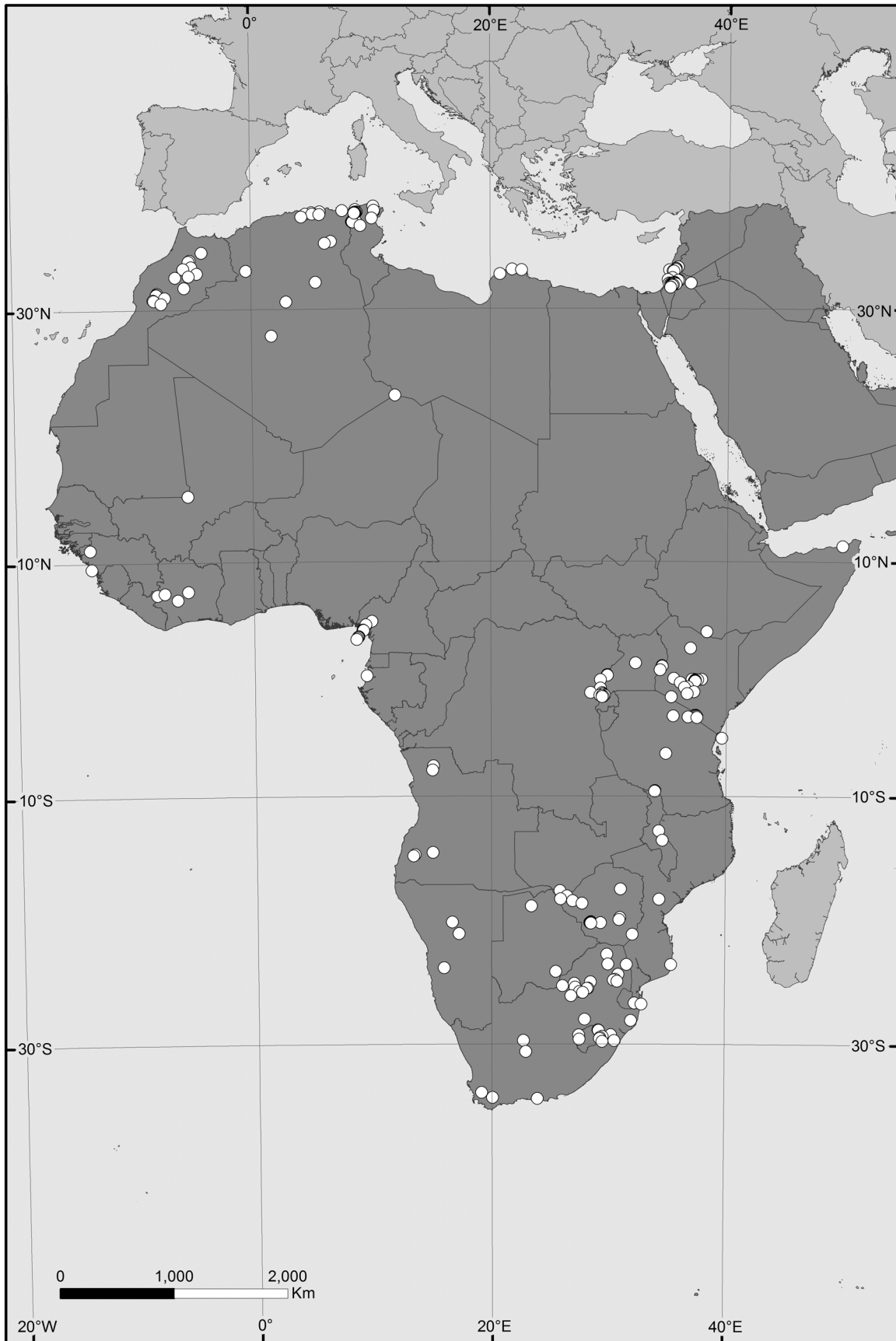


FIGURE 2. Map of Africa and the Arabian Peninsula (highlighted in dark grey), showing reported localities (white circles) for non-marine tardigrades.

The type locality for the individual species is provided, followed by a list of Africa locality sites, listed by country in alphabetical order; geographic co-ordinates as (N-S) northings and (E-W) eastings; reference year; altitude; locality and habitat substrate details.

The geographic co-ordinates and altitude are provided using different font formats depending on the data origin:

- Original data, where provided, are in Roman and bold font.
- Where the original data were provided in decimal degrees and/or in imperial unit format, conversions to degree-minute and/or metric format are preceded by a slash (/) and are in Roman font.
- If the original data are inconsistent (e.g. co-ordinates or altitude not corresponding with the locality description or mismatched altitude for given co-ordinates), we offer nearest potential site using Google Earth™ (ver. 6.2.2.6613), provided in square brackets and Roman font.
- When original co-ordinates were not supplied, we have provided estimated data in italics. In order to estimate co-ordinates and/or altitude, we used Google Earth™ (ver. 6.2.2.6613) and the following rules:
 - where a general locality, administrative unit, or specified location was provided (e.g. building, city, valley, province, country, mountain or mountain range), the collection site was approximated to the centre of the smallest viable unit (assisted by an additional data, e.g. altitude);
 - sample sites described as x distance in y direction from a named locality (e.g. city), were approximated using Google™ Earth tools;
 - the midpoint between localities A and B for sample sites reported as, “alongside a road between locality A and B”, was used unless altitude data could provide a more reasonable estimate;
 - for samples collected from or near a river, the mid-point of the river was chosen with consideration to additional data (e.g. altitude, country, region or district).

Below each species list there is a summary of records per country and the total number of records in Africa. Finally, at the bottom there are brief remarks on the current species distribution and taxonomy.

Throughout the paper we use the term ‘currently endemic’ where species distribution records are restricted to a particular country or a given geographic region. However, it is important to note that the general paucity of tardigrade records make it impossible to verify whether a taxon is truly locally endemic.

List of limno-terrestrial tardigrade species records in Africa

Legend:

sensu lato = “in the broad sense”, doubtful identification (explained in species Remarks)

[F] = freshwater species

[T] = terrestrial species

[T/F] = species found both in terrestrial and freshwater habitats

[m] = molecular data available for a given species

19°04'N, 70°42'W = Original co-ordinates (unchanged)

/ 19°04'N, 70°42'W = Co-ordinates converted to degrees & minutes (when the originals are in decimal degrees)

[19°04'N, 70°42'W] = Co-ordinates suggested from Google Earth™ (when the originals are inconsistent)

19°04'N, 70°42'W = Co-ordinates estimated using Google Earth™ (when the originals were not provided)

Note: The last four denotations (i.e. original, converted, suggested and estimated data) are also used for altitude. All corrected descriptive information (e.g. geographic names, plant formation names) are given in square brackets directly after the erroneous names.

Phylum: Tardigrada Spallanzani, 1776

Class: Heterotardigrada Marcus, 1927

Order: ECHINISCOIDEA Richters, 1926

Family: Echiniscoididae Kristensen & Hallas, 1980

Genus: Echiniscoides Plate, 1888

1. *Echiniscoides sigismundi* (M. Schultze, 1865) *sensu lato*

Terra typica: North Sea (Belgium, Europe)

Democratic Republic of Congo:

- $00^{\circ}47'S$, $29^{\circ}18'E$; **1,000 m asl**: South Kivu Province, Albert National Park [Virunga National Park], Rwindi, soil sample. **Teunissen (1938)**

Record numbers. Democratic Republic of Congo: 1; **total: 1.**

Remarks. This is an unusual report of a coastal marine genus that was described from an inland soil environment. The description of 12 females, one male and 19 juveniles plus eggs suggests this is a valid identification. Whether the original samples were the result of contaminated sampling gear or this species truly occurs within the African Rift, requires further exploration.

Family: Echiniscidae Thulin, 1928

Genus: *Bryodelphax* Thulin, 1928

2. *Bryodelphax maculatus* Gąsiorek, Stec, Morek, Marnissi & Michalczyk, 2017 [T]

Bryodelphax maculatus sp. nov. (Gąsiorek *et al.* 2017)

Terra typica: Tunisia (Africa)

Tunisia:

- $36^{\circ}43'20''N$, $08^{\circ}40'58''E$; **668 m asl**: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek *et al.* (2017)**
- $36^{\circ}43'19''N$, $08^{\circ}43'30''E$; **474 m asl**: **Type Locality**: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek *et al.* (2017)**

Record numbers. Tunisia: 2; **total: 2.**

Remarks. This recently described species is currently endemic to Tunisia.

3. *Bryodelphax parvulus* Thulin, 1928 *sensu lato* [T]

Bryodelphax parvulus Thulin 1928 (da Cunha & do Nascimento 1964)

Echiniscus (*B.*) *parvulus* (Thulin 1928) (Binda 1971)

Bryodelphax parvulus (Ramløv & Kristensen 1985)

Terra typica: Norway (Europe)

Angola:

- $07^{\circ}47'S$, $15^{\circ}01'E$; **650 m asl**: Uíge Province, near Carmona [Uíge], Estate at Pumba Loge, lichens. **da Cunha & do Nascimento (1964)**

Libya:

- $32^{\circ}29'N$, $20^{\circ}50'E$; **350 m asl**: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Morocco:

- $32^{\circ}56'N$, $05^{\circ}40'W$; **1,700 m asl** [850 m asl]: Meknès-Tafilalet Region, Khénifra, moss. **Binda (1971)**
- $31^{\circ}08'N$, $07^{\circ}55'W$; **1,700 m asl**: Tadla-Azilal Region, Imlil, walnut forest, moss on limestone cliffs. **Ramløv & Kristensen (1985)**
- $31^{\circ}06'N$, $07^{\circ}55'W$; **2,300–2,500 m asl**: Tadla-Azilal Region, path to the Jebel Toubkal, scattered tussock vegetation, moss on basalt and mica slate. **Ramløv & Kristensen (1985)**

Record numbers. Angola: 1, Morocco: 3, Libya: 1; **total: 5.**

Remarks. The considerable morphological variation of *B. parvulus* (e.g. the presence or absence of the spine and papilla on legs, etc.) suggests that this taxon may be a complex of closely related species, each with limited geographic ranges, rather than a single cosmopolitan species (see also Pilato *et al.* 2010). The actual geographic range and the presence of *B. parvulus sensu lato* in Africa must be carefully verified.

4. *Bryodelphax tatrensis* (Węglarska, 1959)

Terra typica: Poland (Europe)

Libya:

- 32°29'N, 20°50'E; 350 m asl: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Record numbers. Libya: 1, **total: 1.**

Remarks. A largely Palaearctic distribution and relatively rare species.

Genus: *Cornechiniscus* Maucci & Ramazzotti, 1981

5. *Cornechiniscus cornutus* (Richters, 1907a) [T]

Cornechiniscus cornutus Richters, 1906 (Pilato & Pennisi 1976)

Cornechiniscus cornutus (Richters, 1906) (Binda & Pilato 1987)

Terra typica: Germany (Europe)

Algeria:

- 31°56'N, 05°24'E; 150 m asl: Ouargla Province, Ain Beida. **Binda & Pilato (1987)**

Libya:

- 32°29'N, 20°50'E; 350 m asl: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Record numbers. Algeria: 1, Libya: 1; **total: 2.**

Remarks. A mainly northern hemisphere (Palaearctic) species with a Nearctic record (McInnes 1994, Kaczmarek *et al.* 2016).

6. *Cornechiniscus lobatus* (Ramazzotti, 1943) [T]

Cornechiniscus lobatus (Ramløv & Kristensen 1985)

Terra typica: Italy (Europe)

Jordan:

- 31°50'N, 36°49'E; 500 m asl: Zarqa Governorate, Zarqa [Azarq Wetland Reserve], moss. **Kaczmarek & Michalczyk (2004a)**

Morocco:

- 30°27'N, 07°32'W; 1,850 m asl: Souss-Massa-Drâa Region, Tizi-n-Taghatine, sparse vegetation, mosses and lichens on isolated basalt cliffs. **Ramløv & Kristensen (1985)**

Record numbers. Jordan: 1, Morocco: 1; **total: 2.**

Remarks. A northern hemisphere species (McInnes 1994a), also known from Nearctic Mexico and Neotropic Peru (Kaczmarek *et al.* 2014, 2015).

Genus: *Echiniscus* C.A.S. Schultze, 1840

7. *Echiniscus africanus* Murray, 1907a [T]

E. africanus sp. n. (Murray 1907a)

Echiniscus africanus Murr. (Murray 1913)

Echiniscus africanus John Murray 1907 (da Cunha & do Nascimento 1964)

Echiniscus africanus Murray 1907 (Binda & Pilato 1995a)

Echiniscus cf. *africanus* (Murray, 1907) (Middleton 2003)

Terra typica: Republic of South Africa (Africa)

Angola:

- 07°47'S, 15°01'E; 650 m asl: Uíge Province, near Carmona [Uíge], Estate at Pumba Loge, mosses. **da Cunha & do Nascimento (1964)**

Lesotho:

- 29°19'S, 27°29'E; 1,550 m asl: Maseru District, Maseru, moss or lichen on tree or rock. **Middleton (2003)**

- 29°38'S, 27°31'E; 1,750 m asl: Maseru District, Morija, moss or lichen on tree or rock. **Middleton (2003)**

Republic of South Africa:

- 23°50'S, 29°59'E; 1,450 m asl: N Transvaal [Limpopo Province], Woodbush [Woodbush Forest Reserve]. **Murray (1913)**

- 29°44'S, 22°44'E: **Type Locality:** Undefined locality, Cape Colony [Cape Province]. **Murray (1907a)**

Tanzania:

- 03°12'S, 37°31'E; 2,200–2,400 m asl: Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1995a)**

Record numbers. Angola: 1, Lesotho: 2, Republic of South Africa: 2, Tanzania: 1; **total: 6.**

Remarks. Species only recorded from continental Africa and an uncertain record from Vietnam (Węglarska 1962).

8. *Echiniscus angolensis* da Cunha & do Nascimento Ribeiro, 1964 [T]

Echiniscus angolensis da Cunha & Nascimento Ribeiro, 1964 (Van Rompu *et al.* 1991a)

Echiniscus angolensis da Cunha & Ribeiro, 1964 (Middleton 2003)

Terra typica: Angola (Africa)

Angola:

- 15°01'S, 13°22'E; 1,950 m asl: **Type Locality**: Huíla Province, Sá da Bandeira [Lubango], Boca da Humpata, lichens. **da Cunha & do Nascimento (1964)**

Botswana:

- 19°10'S, 23°25'E; 950 m asl: North West District, Moremi, lichen on tree. **Middleton (2003)**

Tanzania:

- 03°17'S, 37°31'E; ca. 1,500 m asl: Kilimanjaro Region, Kilimanjaro National Park, Marangu gate, rain forest, below tree line, river, pH 5.5, water temperature 12°C, benthos sample. **Van Rompu *et al.* (1991a)**

Record numbers. Angola: 1, Botswana: 1, Tanzania: 1; **total: 3.**

Remarks. A species with a disjunct distribution, reported from Africa and South and Central America (McInnes 1994, Kaczmarek *et al.* 2014, 2015), which potentially hides either more than one cryptic species, a rare species with very specific habitat requirements, or a species with Pan-tropical distribution.

9. *Echiniscus arctomys* Ehrenberg, 1853 *sensu lato* [T]

E. arctomys EHR (Murray 1907b)

Terra typica: Switzerland (Europe)

Uganda:

- 01°22'N, 32°17'E: Undefined locality, moss. **Murray (1907b)**

Record numbers. Uganda: 1; **total: 1.**

Remarks. This reference to cysts in moss samples from Uganda (Murray 1907b), is questionable.

10. *Echiniscus bigranulatus* Richters, 1908 *sensu lato* [T] [m]

Echiniscus bigranulatus Richters. (Heinis 1928)

Echiniscus bigranulatus (Iharos 1969a)

Echiniscus bigranulatus Richters, 1907 (Middleton 2003)

Terra typica: Argentina (South America)

Botswana:

- 24°25'S, 25°31'E; 1,150 m asl: Kweneng District, Molepolole, lichen on tree. **Middleton (2003)**

Cameroon:

- 04°57'N, 09°56'E; 800 m asl: Littoral Region, Kongsamba [Nkongsamba], moss on tree. **Iharos (1969a)**

Republic of South Africa:

- 30°34'S, 22°56'E: Undefined locality. **Heinis (1928)**

Record numbers. Botswana: 1, Cameroon: 1, Republic of South Africa: 1; **total: 3.**

Remarks. This bona fide species belongs to the Neotropical and Antarctic *bigranulatus* group but is easily mistaken for other siblings (see: Michalczyk & Kaczmarek 2006a, 2007). All records prior to 2006 require confirmation, while the three uncertain records from Africa require re-examination and confirmation.

11. *Echiniscus bisculptus* Maucci, 1983 [T]

Echiniscus bisculptus sp. nov. (Maucci 1983)

Terra typica: Morocco (Africa)

Morocco:

- 34°04'N, 04°07'W; 1,500 m asl: Taza [Taza-Al Hoceima-Taounate Region], Bab Bou Idir, in the sun, moss on rock. **Maucci (1983)**

Record numbers. Morocco: 1; **total: 1.**

Remarks. Only recorded from Portugal and Morocco (McInnes 1994); a possible Palaearctic taxon.

12. *Echiniscus bisetosus* Heinis, 1908a [T]

Echiniscus (E) bisetosus Heinis, 1908 (Binda 1971)

Terra typica: Switzerland (Europe)

Algeria:

- 34°40'N, 06°11'E; 0 m asl: Biskra Province, 30 km from Biskra, El Oued [Zeribet el Oued]. **Binda & Pilato (1987)**

Morocco:

- 31°12'N, 07°52'W; 2,500 m asl [2,600 m asl]: Marrakesz-Tansift-Al-Hauz Region, Oukaïmeden, moss. **Binda (1971)**

Record numbers. Algeria: 1, Morocco: 1; **total: 2.**

Remarks. Species with typical Holarctic distribution recorded from many localities in Europe and fewer from Canada, Afghanistan, Algeria and Morocco (McInnes 1994).

13. *Echiniscus blumi* Richters, 1903 [T] [m]

Echiniscus blumi (Ramløv & Kristensen 1985)

Echiniscus (*Echiniscus*) *blumi* Richters, 1903 (Séméria 1986)

Terra typica: Svalbard (Spitsbergen)

Israel and Palestinian National Authority:

- 31°42'N, 35°12'E; 800 m asl: Judean Mountains, Bethlehem, steppe, semi-arid climate, moss (*Bryum* sp.) on rock. **Rahm (1936)**

Libya:

- 32°29'N, 20°50'E; 350 m asl: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Morocco:

- 33°31'N, 05°07'W; 1,650 m asl: Meknès-Tafilalet Region, Ras al Ma [Res el Ma], mosses and lichens on trees (*Cedrus*) and rocks. **Séméria (1986)**
- 33°27'N, 05°13'W; 1,250 m asl: Meknès-Tafilalet Region, ca. 30 [60] km S of Meknes, Azrou, mosses and lichens. **Séméria (1986)**
- 33°04'N, 05°00'W; 2,000 m asl [2,100 m asl]: Meknès-Tafilalet Region, near Aguelmane de Si-Ali (Col du Zad) [Aguelmame Sidi Ali lake], scattered basalt blocks (lava field) lying on the shores of the lake, mosses on basalt blocks. **Ramløv & Kristensen (1985)**
- 32°25'N, 05°13'W; 1,750 m asl: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on basalt boulders in the forest glade. **Ramløv & Kristensen (1985)**
- 31°06'N, 07°55'W; 2,300–2,500 m asl: Tadla-Azilal Region, path to the Jebel Toubkal, scattered tussock vegetation, moss on basalt and mica slate. **Ramløv & Kristensen (1985)**
- 30°27'N, 07°32'W; 1,850 m asl: Souss-Massa-Drâa Region, Tizi-n-Taghatine, sparse vegetation, mosses and lichens on isolated basalt cliffs. **Ramløv & Kristensen (1985)**

Tunisia:

- 36°46'N, 08°41'E; 650 m asl: Jendouba Governorate, surroundings of Ain Draham [Ayn Drahim]. **Binda & Pilato (1987)**

Record numbers. Israel and Palestinian National Authority: 1, Libya: 1, Morocco: 6, Tunisia: 1; **total: 9.**

Remarks. This species is believed to be almost cosmopolitan, however, the *locus typicus* is in the Arctic and most of the records are from the Northern Hemisphere (Europe and North America) (McInnes 1994). *Echiniscus blumi* should perhaps be considered Holarctic, with records from other parts of the world requiring confirmation (Kaczmarek *et al.* 2015).

14. *Echiniscus canadensis* Murray, 1910 [T]

E. canadensis (Ramløv & Kristensen 1985)

Terra typica: Canada (North America)

Algeria:

- 34°40'N, 06°11'E; 0 m asl: Biskra Province, 30 km from Biskra, El Oued [Zeribet el Oued]. **Binda & Pilato (1987)**

Morocco:

- 33°04'N, 05°00'W; 2,000 m asl [2,100 m asl]: Meknès-Tafilalet Region, near Aguelmane de Si-Ali (Col du Zad) [Aguelmame Sidi Ali Lake], scattered basalt blocks (lava field) lying on the shores of the lake, mosses on basalt blocks. **Ramløv & Kristensen (1985)**
- 30°27'N, 07°32'W; 1,850 m asl: Souss-Massa-Drâa Region, Tizi-n-Taghatine, sparse vegetation, mosses and lichens on isolated basalt cliffs. **Ramløv & Kristensen (1985)**

Record numbers. Algeria: 1, Morocco: 2; **total: 3.**

Remarks. Species with a typical Holarctic distribution, widely distributed in Europe and North America (McInnes 1994) (the uncertain records from Argentina need confirmation – Kaczmarek *et al.* 2015).

15. *Echiniscus carusoi* Pilato, 1972

Terra typica: Italy (Europe)

Libya:

- 32°29'N, 20°50'E; 350 m asl: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Record numbers. Libya: 1, **total: 1.**

Remarks. Species with a limited distribution of Southern Italy and Libya (McInnes 1994).

16. *Echiniscus cirinoi* Binda & Pilato, 1993 [T]

Echiniscus cirinoi n. sp. (Binda & Pilato 1993)

Terra typica: Tanzania (Africa)

Tanzania:

- $03^{\circ}12'S$, $37^{\circ}31'E$; **2,200–2,400 m asl:** **Type Locality:** Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1993)**

Record numbers. Tanzania: 1; **total: 1.**

Remarks. This species is currently endemic to Tanzania.

17. *Echiniscus crassispinosus* Murray, 1907a *sensu stricto* [T]

E. crassispinosus sp. n. (Murray 1907a)

Echiniscus crassispinosus Murray (?) (Murray 1913)

Echiniscus crassispinosus J. Murray, 1907 (Teunissen 1938)

Terra typica: Republic of South Africa (Africa)

Democratic Republic of Congo:

- $01^{\circ}17'S$, $29^{\circ}31'E$; **1,750 m asl:** North Kivu Province, Albert National Park [Virunga National Park], Tshengelero [Tshengere] (swamp N of Munagana), soil. **Teunissen (1938)**

Kenya:

- $01^{\circ}15'S$, $36^{\circ}41'E$; **2,000 m asl:** Kiambu County, Kikuyu, moss. **Murray (1913)**

Republic of South Africa:

- $29^{\circ}44'S$, $22^{\circ}44'E$; **Type Locality:** Undefined locality, Cape Colony [Cape Province]. **Murray (1907a)**

Record numbers. Democratic Republic of Congo: 1, Kenya: 1, Republic of South Africa: 1; **total: 3.**

Remarks. Originally described from Africa this species also has single reports from Asia, Central and South America (McInnes 1994a, Kaczmarek *et al.* 2014a, Kaczmarek *et al.* 2015). The limited early description of *E. crassispinosus* (Murray, 1907a) requires new material from the type locale to confirm both the species and its biogeographic description.

18. *Echiniscus crassispinosus fasciatus* Marcus, 1928 [T]

Echiniscus crassispinosus Murray (?) (Murray 1913)

E. (E.) crassispinosus John Murr. forma *fasciatus* nom. nov. (Marcus 1928)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- $01^{\circ}15'S$, $36^{\circ}41'E$; **2,000 m asl:** **Type Locality:** Kiambu County, Kikuyu, moss. **Murray (1913), Marcus (1928)**

Record numbers. Republic of South Africa: 1; **total: 1.**

Remarks. Species recorded from type locality and from three uncertain records from Brazil (for more details see Kaczmarek *et al.* 2015).

19. *Echiniscus duboisi* Richters, 1902 [T]

Echiniscus duboisi Richters (Murray 1913)

Echiniscus duboisi F. Richters, 1902 (Teunissen 1938)

Terra typica: Java (Indonesia)

Republic of South Africa:

- $29^{\circ}44'S$, $22^{\circ}44'E$: Undefined locality, Cape Colony [Cape Province], moss. **Murray (1913)**
- $29^{\circ}44'S$, $30^{\circ}32'E$; **750 m asl:** KwaZulu-Natal Province, Tala Private Game Reserve, lichen on tree (*Acacia*). **Meyer & Hinton (2009)**

Rwanda:

- $01^{\circ}24'S$, $29^{\circ}39'E$; **3,000 m asl:** Northern Province, Albert National Park [Volcanoes National Park/ Mgahinga Gorilla National Park], W slope of Gahinga Volcano, bamboo forest, soil. **Teunissen (1938)**

Record numbers. Republic of South Africa: 2; Rwanda: 1; **total: 3.**

Remarks. Species with a limited tropical and subtropical distribution from Africa, Australia, Indonesia and South America (McInnes 1994).

20. *Echiniscus granulatus* (Doyère, 1840) [T]

Echiniscus (E.) granulatus (Doy., 1840) (Binda 1971)

E. granulatus (Ramløv & Kristensen 1985)

E. (E.) granulatus (Doyère, 1840) (Séméria (1986)

Terra typica: France (Europe)

Algeria:

- 36°28'N, 04°14'E; 1,700 m asl: Tizi Ouzou Province, Massif of Djurdjura (Assouille depression). **Binda & Pilato (1987)**

Morocco:

- 33°31'N, 05°07'W; 1,650 m asl: Meknès-Tafilalet Region, Ras al Ma [Res el Ma], mosses on trees (*Cedrus*) and rocks. **Séméria (1986)**
- 32°56'N, 05°40'W; 1,700 m asl [850 m asl]: Meknès-Tafilalet Region, Khénifra, moss. **Binda (1971)**
- 32°25'N, 05°13'W; 1,750 m asl: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on limestone boulders in the forest glade and moss on soil, fallen branches and stems (2 samples). **Ramløv & Kristensen (1985)**
- 31°08'N, 07°55'W; 1,700 m asl: Tadla-Azilal Region, Imlil, walnut forest, moss on limestone cliffs. **Ramløv & Kristensen (1985)**

Record numbers. Algeria: 1, Morocco: 5; **total: 6.**

Remarks. Originally described from France, this species has mainly been reported from Europe and Asia, indicating a Palearctic distribution. The few records outside this area (see: McInnes 1994), need confirmation.

21. *Echiniscus kerguelensis* Richters, 1904a *sensu lato* [T]

E. (E.) kerguelensis Richters 1904 (Marcus 1936)

Terra typica: Kerguelen Island (South Indian Ocean)

Namibia:

- 20°28'S, 16°39'E; 1,600 m asl [1,500 m asl]: Otjozondjupa Region, Otjiwarongo. **Marcus (1936)**

Record numbers. Namibia: 1; **total: 1.**

Remarks. The record for three eggs in exuvia and a two clawed juvenile, suggests a tentative identification. Originally described from the Kerguelen Islands in the southern Indian Ocean, this species requires a re-description from the type locality before the various records attributed to this species can be clarified.

22. *Echiniscus limai* da Cunha & do Nascimento Ribeiro, 1964 [T]

Echiniscus limai sp. n. (da Cunha & do Nascimento Ribeiro 1964)

Terra typica: Angola (Africa)

Angola:

- 07°25'S, 15°06'E; 850 m asl: **Type Locality:** Uíge Province, Mahondo, lichens. **da Cunha & do Nascimento (1964)**

Record numbers. Angola: 1; **total: 1.**

Remarks. The species has a disjunct Africa (type locale) and Asia distribution (Beasley & Cleveland 1996; Kaczmarek & Beasley 2002; Li *et al.* 2008), suggesting that the Asian records need re-assessment.

23. *Echiniscus longispinosus* Murray, 1907a [T]

E. longispinosus sp. n. (Murray 1907a)

Echiniscus longispinosus Murray 1907 (Pilato *et al.* 1991)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- 29°44'S, 22°44'E: **Type Locality:** Undefined locality, Cape Colony [Cape Province]. **Murray (1907a)**
- 34°01'S, 23°55'E; 200 m asl: Eastern Cape Province, Tzitzikama [Tsitsikamma National Park], moss. **Binda (1984), Pilato *et al.* (1991)**

Record numbers. Republic of South Africa: 2; **total: 2.**

Remarks. The species is currently endemic to Republic of South Africa.

24. *Echiniscus mediantus* Marcus, 1930 [T]

E. mediantus (Ramløv & Kristensen 1985)

Terra typica: Scotland (Europe)

Morocco:

- 33°04'N, 05°00'W; 2,000 m asl [2,100 m asl]: Meknès-Tafilalet Region, near Aguelmane de Si-Ali (Col du Zad) [Aguelmame Sidi Ali lake], scattered basalt blocks (lava field) lying on the shores of the lake, mosses taken on basalt blocks. **Ramløv & Kristensen (1985)**

Record numbers. Morocco: 1; **total: 1.**

Remarks. With reports mainly from Europe, Greenland and Morocco (McInnes 1994), this species has a Palearctic distribution.

25. *Echiniscus merokensis* Richters, 1904b *sensu lato* [T]

Echiniscus merokensis Richt (Marcus 1928)

Terra typica: Norway (Europe)

?Africa:

- 23°30'N, 12°00'E: Undefined locality, N Africa. **Marcus (1928), Rahm (1928)**

Algeria:

- 36°53'N, 07°39'E; **800 m asl**: Annaba Province, Massif of Eldough [Edough Mountains]. **Binda & Pilato (1987)**
- 36°40'N, 04°36'E; **1,400 m asl**: Tizi Ouzou Province, Akfadou Forest. **Binda & Pilato (1987)**
- 36°38'N, 05°45'E; **1,200 m asl**: Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**

Record numbers. ?Africa: 1, Algeria: 3; **total 4.**

Remarks. The morphological descriptions of *E. merokensis* in various reports exhibit a great deal of variation, suggestive of a species complex (see: Ramazzotti & Maucci 1983). However, most of the records (including the type locality) are Holarctic (McInnes 1994), which implies the records from other regions need confirmation.

26. *Echiniscus merokensis suecicus* Thulin, 1911 [T]

Echiniscus merokensis Richters forma *suecica* Thulin, 1911 (da Cunha & do Nascimento 1964)

Terra typica: Sweden (Europe)

Angola:

- 07°25'S, 15°06'E; **850 m asl**: Uige Province, Mahondo, lichens. **da Cunha & do Nascimento (1964)**

Record numbers. Angola: 1; **total: 1.**

Remarks. A subspecies, which with further analysis may be elevated to species is recorded mainly from European localities, Greenland and Angola (McInnes 1994). Probably a Palearctic taxon.

27. *Echiniscus migiurtinus* Franceschi, 1957 [T]

Echiniscus (Echiniscus) migiurtinus sp. nov. (Franceschi 1957)

Terra typica: Somalia (Africa)

Somalia:

- 11°20'N, 49°45'E; **2,000 m asl**: Bari Region, Migiurtinia, Uar Medò mountain group [Warmadoow] lichen. **Franceschi (1957)**

Record numbers. Somalia: 1; **total: 1.**

Remarks. This species has only two reports from the type locale and China (Yang 2002a), but the disjunct distribution suggests an error. Further analysis is required to verify this species and whether it is endemic to Somalia.

28. *Echiniscus perarmatus* Murray, 1907a [T]

E. perarmatus sp. n. (Murray 1907a)

E. perarmatus, Murray (Murray 1907b)

Echiniscus perarmatus Murray 1907 (Binda *et al.* 2001)

Terra typica: Republic of South Africa (Africa)

Democratic Republic of Congo:

- 01°10'S, 28°28'E; **1,000 m asl**: North Kivu Province, outskirts of Mohanga, moss (*Entodon* sp.). **Binda *et al.* (2001)**

Republic of South Africa:

- 29°44'S, 22°44'E: **Type Locality**: Undefined locality, Cape Colony [Cape Province]. **Murray (1907a,b)**

Record numbers. Democratic Republic of Congo: 1, Republic of South Africa: 1; **total: 2.**

Remarks. A locally abundant species reported from a limited number of tropical and subtropical localities in Africa, Indonesia, Hawaii, North and South America (McInnes 1994).

29. *Echiniscus poeensis* Rodriguez-Roda, 1947 [T]

Echiniscus (E.) poeensis sp. n. (Rodriguez-Roda 1947)

Terra typica: Equatorial Guinea (Africa)

Equatorial Guinea:

- 03°36'N, 08°46'E; **2,500 m asl**: **Type Locality**: Fernando Póo [Bioko Island], Bioko Norte Province, Pico Basilé, mosses and liverworts between *Lycopodium* sp. **Rodriguez-Roda (1947)**

Record numbers. Equatorial Guinea: 1; **total: 1.**

Remarks. This species has not been reported again since Rodriguez-Roda (1947), but is currently endemic to Equatorial Guinea.

30. *Echiniscus pusae* Marcus, 1928 [T]

Echiniscus sp. (Murray 1907a)
Echiniscus pusae nom. nov. (Marcus 1928)
Echiniscus pusae Marcus, 1928 (Pilato *et al.* 2003)
Terra typica: Republic of South Africa (Africa)

Democratic Republic of Congo:

- $01^{\circ}10'S$, $28^{\circ}28'E$; 1,000 m asl: North Kivu Province, outskirts of Mohanga, liverwort (*Plagiochila porelloides*). **Pilato *et al.* (2003)**

Republic of South Africa:

- $29^{\circ}44'S$, $22^{\circ}44'E$: **Type Locality:** Undefined locality, Cape Colony [Cape Province]. **(Murray 1907a), Marcus (1928)**

Record numbers. Democratic Republic of Congo: 1, Republic of South Africa: 1; **total: 2.**

Remarks. Only reported from Africa and Indonesia (Lombok) (McInnes 1994); a possible tropical/ subtropical distribution.

31. *Echiniscus quadrispinosus* Richters, 1902 *sensu lato* [T]

Echiniscus quadrispinosus Richters (Murray 1913)
Terra typica: Germany (Europe)

Kenya:

- $00^{\circ}01'S$, $37^{\circ}54'E$: Undefined locality, British East Africa [Kenya], moss. **Murray (1913)**

Record numbers. Kenya: 1; **total: 1.**

Remarks. There is considerable morphological variation in the global records of *E. quadrispinosus*, indicative of a species complex (see: Ramazzotti & Maucci 1983). However, most of the species records are (like the type locality) Holarctic (McInnes 1994), which suggest that African reports may be correct but, these early reports, require confirmation.

32. *Echiniscus reticulatus* Murray, 1905a [T]

Echiniscus reticulatus J. Murray, 1905 (Teunissen 1938)
Terra typica: Scotland (Europe)

Democratic Republic of Congo:

- $01^{\circ}18'S$, $29^{\circ}29'E$; **2,250 m asl** [2,100 m asl]: North Kivu Province, Albert National Park [Virunga National Park], Tshamugussa (Bweza area, SW[sic] (north west) of Visoke and Musule volcanoes), soil. **Teunissen (1938)**

Record numbers. Democratic Republic of Congo: 1; **total: 1.**

Remarks. A species known from a few (Asian and European) Palaearctic localities (McInnes 1994); but this single African/ tropical report requires confirmation. *Echiniscus reticulatus* belongs to the *arctomys* group, which is currently considered a species complex nested within the larger (possibly polyphyletic) '*arctomys* group' – sensu Ramazzotti & Maucci 1983). This African record requires an integrated morphological/ molecular verification.

33. *Echiniscus rugospinosus* Marcus, 1928 [T]

Echiniscus sp. (Murray 1913)
Echiniscus rugospinosus nom nov. (Marcus 1928)
Terra typica: East Africa

Uganda/Kenya:

- $00^{\circ}47'N$, $34^{\circ}22'E$: **Type Locality:** Undefined locality, tropical East Africa. **(Murray 1913; as an unnamed species), Marcus (1928)**

Record numbers. Uganda/Kenya: 1; **total: 1.**

Remarks. This species has not been reported since the original reference (Murray 1913), and although currently endemic to Africa, it will be difficult to locate and verify the type locality.

34. *Echiniscus scabrospinosus* Fontoura, 1982 [T]

Echiniscus scabrospinosus Fontoura 1982 (Binda & Pilato 1995a)
Terra typica: Portugal (Europe)

Tanzania:

- $03^{\circ}12'S$, $37^{\circ}31'E$; **2,200–2,400 m asl**: Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1995a)**

Record numbers. Tanzania: 1; **total: 1.**

Remarks. This rare species has only been reported as single specimens from its type locale (Portugal), the Azores (Fontoura *et al.* 2008a) and Tanzania.

35. *Echiniscus spiniger* Richters, 1904c [T]

E. spiniger (Ramløv & Kristensen 1985)

Terra typica: Sweden (Europe)

Morocco:

- 31°08'N, 07°55'W; 1,700 m asl: Tadla-Azilal Region, Imlil, walnut forest, moss on limestone cliffs. **Ramløv & Kristensen (1985)**

Record numbers. Morocco: 1; **total: 1.**

Remarks. This species recorded from numerous European localities and single sites in Asia, Indonesia, Australia, New Zealand, North and South America (McInnes 1994a). Such a wide geographic distribution suggests a species complex or misidentifications. Nominal species should be considered Palearctic.

36. *Echiniscus testudo* (Doyère, 1840) [T] [m]

Echiniscus testudo Doyère, 1840, *Echiniscus testudo* Doyère, 1840 subsp. *trifilis* Rahm 1925 (Rahm 1936)

Echiniscus muscicola (Iharos 1969a)

Echiniscus testudo Doy. (Iharos 1978)

E. testudo (Ramløv & Kristensen 1985)

Echiniscus testudo (Doyère, 1840) (Kaczmarek & Michalczyk 2004a)

Terra typica: France (Europe)

Cameroon:

- 04°12'N, 09°12'E; **2,900–3,000 m asl**: Southwest Region, Mount Cameroon National Park, Mount Cameroon, moss on tree and lava blocks. **Iharos (1969a)**

Israel and Palestinian National Authority:

- 32°59'N, 35°45'E: Undefined locality, Golan Heights, moss. **Jørgensen et al. (2007, 2013)**
- 31°53'N, 35°27'E; -200 m asl: old Jericho, excavations, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), extreme arid, semi-arid or semi-humid climate, lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°52'N, 35°26'E; 0 m asl: Jericho, Quarantania Mt. (The Mount of Temptation), rock, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°51'N, 35°25'E; -100 m asl: near Jericho, St. George's Monastery, Wadi Qelt, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°50'N, 34°59'E; 250 m asl: Judean Mountains, Emmaus (Emmaus Nicopolis), extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°50'N, 35°11'E; 900 m asl: Judean Mountains, Nabi Samwil (al-Nabi Samuil), extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°50'N, 35°23'E; -50 m asl: on the road to Jericho, Chan of the Samaritan, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°48'N, 35°13'E; 800 m asl: Judean Mountains, Jerusalem, Tombs of the Sanhedrin [Tombs of the Judges], extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°48'N, 35°15'E; 800 m asl: Judean Mountains, Jerusalem, Scopus Mt., The Hebrew University, rocks, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°47'N, 35°14'E; 750 m asl: Judean Mountains, Jerusalem, temples walls, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°47'N, 35°14'E; 750 m asl: Judean Mountains, Jerusalem, Gethsemane, bark of olive trees, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°47'N, 35°14'E; 750 m asl: Judean Mountains, Jerusalem, Gethsemane, rocks from grave of Mary [Church of the Assumption (Mary's Tomb)], extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°47'N, 35°14'E; 750 m asl: Judean Mountains, Jerusalem, Scopus Mt., E [W] from The Hebrew University, Wadi et Tur [Wadi al-Joz], extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- 31°47'N, 35°15'E; 800 m asl: Judean Mountains, Jerusalem, Olives Mt., Pater Noster church, Russians tower, wall of

church, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**

- $31^{\circ}46'N$, $35^{\circ}10'E$; 650 m asl: Judean Mountains, Jerusalem, Ein Kerem, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}46'N$, $35^{\circ}12'E$; 750 m asl: Judean Mountains, Jerusalem, Monastery of the Cross, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}46'N$, $35^{\circ}12'E$; 750 m asl: Judean Mountains, Jerusalem, Monastery of the Cross, garden in Katamin?, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}46'N$, $35^{\circ}13'E$; 800 m asl: Undefined locality, Betschar bei Kilometer 22, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}46'N$, $35^{\circ}14'E$; 650 m asl: Judean Mountains, Jerusalem, Aceldama, rock, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}46'N$, $35^{\circ}14'E$; 750 m asl: Judean Mountains, Jerusalem, Zion Mt., wall behind the Church of Zion, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}46'N$, $35^{\circ}14'E$; 750 m asl: Judean Mountains, Jerusalem, Church of Saint Peter in Gallicantu, rock, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}43'N$, $35^{\circ}17'E$; 600 m asl: Judean Mountains, al-Ubeidiya, Monastery Deir Dosi (Monastery of St. Theodosius), extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}42'N$, $35^{\circ}12'E$; 800 m asl: Judean Mountains, Bethlehem, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}42'N$, $35^{\circ}20'E$; 250 m asl: Great Lavra of St. Sabbas the Sanctified (Mar Saba), extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}40'N$, $35^{\circ}15'E$; 750 m asl: Judean Mountains, Herodyon National Park, Herodion, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}33'N$, $35^{\circ}06'E$; 1,000 m asl: Judean Mountains, Hebron, Mamre, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**

Jordan:

- $32^{\circ}02'N$, $35^{\circ}44'E$; 800 m asl: Balqa Governorate, As-Salt, extreme arid, semi-arid or semi-humid climate, mosses (*Syntrichium* sp., *Hypnum* sp. or *Tortula* sp.), lichens or liverworts (*Frullania* sp.) on rock, stone walls or trees. **Rahm (1936)**
- $31^{\circ}50'N$, $36^{\circ}49'E$; 500 m asl: Zarqa Governorate, Zarqa [Azarq Wetland Reserve], moss. **Kaczmarek & Michalczyk (2004a)**

Libya:

- $32^{\circ}29'N$, $20^{\circ}50'E$; 350 m asl: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Morocco:

- $32^{\circ}36'N$, $04^{\circ}32'W$; 1,900 m asl: Meknès-Tafilalet Region, Tizi-n-Talrhemt, moss or lichen. **Jorgensen et al. (2007)**
- $31^{\circ}35'N$, $05^{\circ}36'W$; 1,650–1800 m asl: Souss-Massa-Drâa Region, Todra [Todgha] Gorge, sparse grass vegetation and few low bushes, moss on limestone cliffs (orthoceratite lime). **Ramløv & Kristensen (1985)**
- $30^{\circ}27'N$, $07^{\circ}32'W$; 1,850 m asl: Souss-Massa-Drâa Region, Tizi-n-Taghatine, sparse vegetation, mosses and lichens on isolated basalt cliffs. **Ramløv & Kristensen (1985), Jorgensen et al. (2007)**

Tunisia:

- $36^{\circ}46'N$, $08^{\circ}41'E$; 700 m asl: Jendouba Governorate, surroundings of Ain Draham, moss on rock. **Iharos (1978)**
- $36^{\circ}07'N$, $08^{\circ}32'E$; 450 m asl: Kef Governorate, along road from El Kef and Sakiet, 21 km W El Kef, “strongly insolated area”, lichen on soil. **Iharos (1978)**

Record numbers. Cameroon: 1, Israel and Palestinian National Authority: 26, Jordan: 2, Libya: 1, Morocco: 3, Tunisia: 2; **total: 35.**

Remarks. The very wide biogeographic range (McInnes 1994a, Jørgensen et al. 2007), suggests a species complex, however most of the reports of this species are Holarctic. *Echiniscus testudo* has mainly been reported from northern Saharan (= Palaearctic) Africa.

37. *Echiniscus trisetosus* Cuénot, 1932 [T]

E. (E.) trisetosus Cuénot, 1932 (Séméria 1986)

Terra typica: Italy (Europe)

Algeria:

- 34°40'N, 06°11'E; 0 m asl: Biskra Province, 30 km from Biskra, El Oued [Zeribet el Oued]. **Binda & Pilato (1987)**

Morocco:

- 33°27'N, 05°13'W; 1,250 m asl: Meknès-Tafilalet Region, ca. 30 [60] km S of Meknes, Azrou, lichens. **Séméria (1986)**

Record numbers. Algeria: 1, Morocco: 1; **total: 2.**

Remarks. This *blumi-canadensis* group species has been reported from numerous Holarctic localities (McInnes 1994; Kaczmarek *et al.* 2016).

38. *Echiniscus wendti* Richters, 1903 [T]

Echiniscus wendti (Iharos 1969a)

Terra typica: Svalbard (Spitsbergen)

Cameroon:

- 04°10'N, 09°13'E; 1,300–1,500 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, rainforest, moss on tree. **Iharos (1969a)**

Record numbers. Cameroon: 1; **total: 1.**

Remarks. This member of the *arctomys* group (see *E. reticulatus* above) has a largely Holarctic distribution (McInnes 1994; Kaczmarek *et al.* 2016); all other records need confirmation (Kaczmarek *et al.* 2015).

Genus: *Parechiniscus* Cuénot, 1926

39. *Parechiniscus chitonides* Cuénot, 1926 [T]

Terra typica: France (Europe)

Libya:

- 32°29'N, 20°50'E; 350 m asl: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Record numbers. Libya: 1; **total: 1.**

Remarks. Palaearctic.

Genus: *Pseudechiniscus* Thulin, 1911

40. *Pseudechiniscus bispinosus* (Murray, 1907a) [T]

E. bispinosus sp. n. (Murray 1907a)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- 29°44'S, 22°44'E: **Type Locality:** Undefined locality, Cape Colony [Cape Province]. **Murray (1907a)**

Record numbers. Republic of South Africa: 1; **total: 1.**

Remarks. This rare species is based on the single original reference from Africa (Murray 1907a) and two early reports from South America (Kaczmarek *et al.* 2015). As no type material is known it may prove difficult to find neotype material.

41. *Pseudechiniscus facettalis* Petersen, 1951 *sensu lato* [T]

Pseudechiniscus suillus (Ehrenberg, 1853) forma *facettalis* Petersen, 1951 (Haspelslagh 1982)

Terra typica: Greenland

Kenya:

- 00°10'S, 37°18'E; 4,270 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Teleki Tarn, small effluent and shallow pond, silt, sediments and sandy gravel. **Haspelslagh (1982)**

Tunisia:

- 36°43'19"N, 08°43'30"E; 474 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek *et al.* (2017)**

Record numbers. Kenya: 1, Tunisia: 1; **total: 2.**

Remarks. A widespread taxon (McInnes 1994a), in the *suillus* species complex. Only two individuals were identified in Kenyan samples and from a non-typical (aquatic) habitat, which coupled with the type locality (Greenland) indicates this African record requires re-examination.

42. *Pseudechiniscus jiroveci* Bartoš, 1963 [T]

Pseudechiniscus jiroveci Bartoš, 1963 (Binda 1984)

Pseudechiniscus jiroveci Bartoš 1963 (Pilato *et al.* 1991, Binda & Pilato 1995a)

Terra typica: China (Asia)

Republic of South Africa:

- $34^{\circ}01'S$, $23^{\circ}55'E$; 200 m asl: Eastern Cape Province, Tizitzikama/ Tzitzikama [Tsitsikamma National Park], moss. **Binda (1984)**, **Pilato *et al.* (1991)**

Tanzania:

- $03^{\circ}09'S$, $35^{\circ}29'E$: Undefined locality, Arusha Region, Ngorongoro Volcano, moss. **Pilato *et al.* (1991)**
- $03^{\circ}12'S$, $37^{\circ}31'E$; **2,200–2,400 m asl**: Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1995a)**

Record numbers. Republic of South Africa: 1, Tanzania: 2; **total: 3.**

Remarks. Originally described from five juvenile (two clawed) individuals (Bartoš, 1963), this rare species has a restricted distribution including the type locale (China), Mongolia (Kaczmarek & Michalczyk 2006) and Africa.

43. *Pseudechiniscus pseudoconifer* Ramazzotti, 1943

Terra typica: Italy (Europe)

Uganda:

- $01^{\circ}22'N$, $32^{\circ}17'E$: Undefined locality. **Binda (1974)**

Record numbers. Uganda: 1; **total: 1.**

Remarks. A passing comment by Binda (1974) places this species in Uganda.

44. *Pseudechiniscus suillus* (Ehrenberg, 1853) *sensu lato* [T]

E. arctomys Ehr. (Murray 1907a)

Echiniscus arctomys Ehrenbg. (Richters 1908)

Echiniscus suillus Ehrenberg. (Richters 1911)

Pseudechiniscus suillus (Ehr.) (Murray 1913)

Pseudechiniscus suillus (Ehrenbg.) Marcus (1928)

P. suillus (Ehrbg.) (Marcus 1936)

Pseudechiniscus suillus Ehrenberg, 1853 (Rahm 1936)

Pseudechiniscus suillus (Ehrbg.) forma *Zavattarii* n. (Pardi 1941)

Pseudechiniscus suillus (Ehrenberg) 1853 (da Cunha & do Nascimento 1964)

Pseudechiniscus suillus (Iharos 1969a)

Pseudechiniscus suillus Ehrbg. (Iharos (1978)

Pseudechiniscus suillus (Ramløv & Kristensen 1985)

Pseudechiniscus suillus (Ehrbg) (Maucci 1993)

Terra typica: Switzerland (Europe)

Angola:

- $07^{\circ}47'S$, $15^{\circ}01'E$; 650 m asl: Uíge Province, near Carmona [Uíge], Estate at Pumba Loge, mosses. **da Cunha & do Nascimento (1964)**

Cameroon:

- $04^{\circ}11'N$, $09^{\circ}12'E$; **1,900–1,950 m asl**: Southwest Region, Mount Cameroon National Park, Mount Cameroon, primeval forest, above bothy No. 1, moss on trees and lava. **Iharos (1969a)**

Ethiopia:

- $04^{\circ}03'N$, $38^{\circ}19'E$; 1,700 m asl: Oromia Region, Mēga, moss (*Neckera* sp.) on tree (*Juniperus procera*). **Pardi (1941)**
- Israel and Palestinian National Authority:
- $31^{\circ}51'N$, $35^{\circ}25'E$; -100 m asl: near Jericho, St. George's Monastery, Wadi Qelt, extreme arid climate, lichen (*Xanthoria parietina* L.). **Rahm (1936)**

Kenya:

- $00^{\circ}01'S$, $37^{\circ}54'E$: Undefined locality, British East Africa [Kenya], moss. **Murray (1913)**

Morocco:

- $32^{\circ}25'N$, $05^{\circ}13'W$; **1,750 m asl**: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on limestone boulders in the forest glade. **Ramløv & Kristensen (1985)**
- $31^{\circ}08'N$, $07^{\circ}55'W$; 1,700 m asl: Tadla-Azilal Region, Imlil, walnut forest, moss on limestone cliffs. **Ramløv & Kristensen (1985)**
- $31^{\circ}06'N$, $07^{\circ}55'W$; **2,300–2,500 m asl**: Tadla-Azilal Region, path to the Jebel Toubkal, scattered tussock vegetation, moss on basalt and mica slate. **Ramløv & Kristensen (1985)**

Republic of South Africa:

- 23°50'S, 29°59'E; 1,450 m asl: N Transvaal [Limpopo Province], Woodbush [Woodbush Forest Reserve]. **Murray (1913)**
- 26°03'S, 27°49'E; 1,500 m asl: Gauteng Province, NE Usumbara. **Richters (1911)**
- 29°44'S, 22°44'E: Undefined locality, Cape Colony [Cape Province]. **Murray (1907a, 1913) (Marcus 1928)**

Tanzania:

- 03°07'S, 37°21'E; ca. 4,000 m asl: Kilimanjaro Region, Kilimanjaro National Park, Barranco trail, above tree line, slow running ice covered brooklet, pH 5.5, water temperature 5°C, benthos sample. **Van Rompu et al. (1991a)**

Tunisia:

- 36°46'N, 08°41'E; 700 m asl: Jendouba Governorate, surroundings of Ain Draham, moss and lichen on tree (*Quercus sauber*). **Iharos (1978)**

Uganda:

- 01°22'N, 32°17'E: Undefined locality. **Murray (1907b, 1913)**

Record numbers. Angola: 1, Cameroon: 1, Ethiopia: 1, Israel: 1, Kenya: 1, Morocco: 3, Republic of South Africa: 3, Tanzania: 1, Tunisia: 1, Uganda: 1; **total: 14.**

Remarks. There is confusion with some early records of *Echiniscus arctomys* (e.g. Murray 1907a, b; Richters 1908), which were identified as in error by Richters (1911), corrected to *Echiniscus suillus* and in Marcus (1928) to *Pseudechiniscus suillus*. The *suillus* species complex (see: Fontoura & Morais 2011) was originally described from Europe (Ehrenberg, 1853), and requires a re-description. Other species within this complex (e.g. *P. facettalis* and *P. santomensis* Fontoura, Pilato & Lisi, 2010) have been described from the African continent and neighbouring islands, though some descriptions (e.g. Pardi 1941) do not conform to the more standard definition of *P. suillus*. The presence of *P. suillus* sensu stricto (in Africa) requires confirmation.

Class: Eutardigrada Richters, 1926

Order: Apochela Schuster, Nelson, Grigarick & Christenberry, 1980

Family: Milnesiidae Ramazzotti, 1962b

Genus: *Milnesium* Doyère, 1840

45. *Milnesium dornensis* Ciobanu, Roszkowska & Kaczmarek, 2015 sensu lato [T]

Milnesium cf. *dornensis* Ciobanu et al., 2015? (Gąsiorek et al. 2017)

Terra typica: Romania (Europe)

Tunisia:

- 36°46'27"N, 08°46'18"E; 501 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**

Record numbers. Tunisia: 1; **total: 1.**

Remarks. The species has previously only been reported from its type locality and this African locality, which needs confirmation.

46. *Milnesium tardigradum* Doyère, 1840 sensu lato [T] [m]

M. tardigradum Doy. (Murray 1907a, Pardi 1941)

Arctiscon tardigradum Schrank (Murray 1913)

M. tardigradum Doy. ? 1812 (Marcus (1936)

Milnesium tardigradum (Franceschi 1957)

Milnesium tardigradum Doyère 1840 (da Cunha & do Nascimento 1964, Pilato et al. 2003)

Milnesium tardigradum (Ramløv & Kristensen 1985)

Milnesium tardigradum Doyere, 1840 (Middleton 2003)

Milnesium tardigradum Doyère, 1840 (Gąsiorek et al. 2017)

Terra typica: France (Europe), terra neotypica: Germany (Europe)

Angola:

- 07°47'S, 15°01'E; 650 m asl: Uíge Province, near Carmona [Uíge], Estate at Pumba Loge, mosses and lichens. **da Cunha & do Nascimento (1964)**
- 14°55'S, 13°30'E; 1,750 m asl: Huíla Province, surroundings of Sá da Bandeira [Lubango], mosses and lichens. **da Cunha & do Nascimento (1964)**

Botswana:

- 19°10'S, 23°25'E; 950 m asl: North West District, Moremi, moss or lichen on tree or rock. **Middleton (2003)**
- 24°25'S, 25°31'E; 1,150 m asl: Kweneng District, Molepolole, moss or lichen on tree or rock. **Middleton (2003)**

Democratic Republic of Congo:

- 00°04'S, 29°18'E; 1,950 m asl: North Kivu Province, outskirts of Lukanga, lichen. **Pilato et al. (2003)**
- 01°10'S, 28°28'E; 1,000 m asl: North Kivu Province, outskirts of Mohanga, moss (*Entodon* sp.). **Pilato et al. (2003)**

Ethiopia:

- 04°03'N, 38°19'E; 1,700 m asl: Oromia Region, Mēga, moss (*Neckera* sp.) on tree (*Juniperus procera*), plant no 80, lichen, former English residence, moss on tree (*Juniperus procera*) and lichen on tree (bark of *Juniperus procera*) (4 samples). **Pardi (1941)**

Israel and Palestinian National Authority:

- 31°48'N, 35°06'E; 700 m asl: Judean Mountains, Kiriath-Jearim [Kariathiarim], semi-humid climate. **Rahm (1936)**
- 31°46'N, 35°12'E; 750 m asl: Judean Mountains, Jerusalem, Monastery of the Cross, garden in Katamin, semi-humid climate, lichen (*Xanthoria parietina* L.) on olive tree. **Rahm (1936)**

Jordan:

- 31°50'N, 36°49'E; 500 m asl: Zarqa Governorate, Zarqa [Azarq Wetland Reserve], moss. **Kaczmarek & Michalczyk (2004a)**

Kenya:

- 00°01'S, 37°54'E: Undefined locality, British East Africa [Kenya], moss. **Murray (1913)**

Lesotho:

- 29°19'S, 27°29'E; 1,550 m asl: Maseru District, Maseru, moss or lichen on tree or rock. **Middleton (2003)**
- 29°35'S, 29°17'E; 2,900 m asl: Thaba-Tseka District, Sani Pass, lichen on stone fence. **Meyer & Hinton (2009)**
- 29°38'S, 27°31'E; 1,750 m asl: Maseru District, Morija, moss or lichen on tree or rock. **Middleton (2003)**

Morocco:

- 33°31'N, 05°07'W; 1,650 m asl: Meknès-Tafilalet Region, Ras al Ma [Res el Ma], mosses trees (*Cedrus*) and rocks. **Séméria (1986)**
- 33°27'N, 05°13'W; 1,250 m asl: Meknès-Tafilalet Region, ca. 30 [60] km S of Meknes, Azrou, lichens. **Séméria (1986)**
- 32°25'N, 05°13'W; 1,750 m asl: Meknès-Tafilalet Region, S of Azrou, cedar forest, mosses on limestone boulders and basalt in the forest glade (2 samples). **Ramløv & Kristensen (1985)**
- 30°27'N, 07°32'W; 1,850 m asl: Souss-Massa-Drâa Region, Tizi-n-Taghatine, sparse vegetation, mosses and lichens on isolated basalt cliffs. **Ramløv & Kristensen (1985)**

Namibia:

- 20°28'S, 16°39'E; 1,500 m asl: Otjozondjupa Region, Otjiwarongo. **Marcus (1936)**

Republic of South Africa:

- 23°03'S, 29°54'E; 950 m asl: Limpopo Province, Louis Trihardt, moss or lichen on tree or rock. **Middleton (2003)**
- 25°45'S, 28°11'E; 1,300 m asl: Gauteng Province, Pretoria, moss. **Murray (1913)**
- 29°38'S, 27°31'E [25°32'S, 26°05'E]; 1,250 m asl: North West Province, Rustenberg [*Rustenburg*], moss or lichen on tree or rock. **Middleton (2003)**
- 25°39'S, 27°10'E; 1,300 m asl: North West Province, Rustenberg [*Rustenburg*], moss or lichen on tree or rock. **Middleton (2003)**
- 25°58'S, 27°32'E [25°59'S, 27°33'E]; 1,400 m asl: Gauteng Province, Magalieseberg [*Magaliesburg*], moss or lichen on tree or rock. **Middleton (2003)**
- 26°18'S, 26°55'E [26°19'S, 26°49'E]; 1,500 m asl: North West Province, Ventersdorp, moss or lichen on tree or rock. **Middleton (2003)**
- 28°13'S, 31°57'E; 350 m asl: KwaZulu-Natal Province, Hluhluwe-Imfolozi Game Park, lichen on tree (*Acacia*). **Meyer & Hinton (2009)**
- 29°44'S, 22°44'E: Undefined locality, Cape Colony [Cape Province]. **Murray (1907a)**
- 29°44'S, 30°32'E; 750 m asl: KwaZulu-Natal Province, Tala Private Game Reserve, lichen on tree (*Acacia*). **Meyer & Hinton (2009)**

Somalia:

- 11°20'N, 49°45'E; 2,000 m asl: Bari Region, Migiurtinia, Uar Medò mountain group [Warmadoow] lichen. **Franceschi (1957)**

Tunisia:

- 36°57'N, 08°45'E; 0 m asl: Jendouba Governorate, surroundings of Tabarka. **Binda & Pilato (1987)**
- 36°07'N, 08°30'E; 350 m asl: Kef Governorate, road between El Kef and Sakiet, 23 km W El Kef, Qued el Kohl, scrub, sparse vegetation, with stony ground and thin layer of surface soil, soil with vegetable debris or litter under trees (*Pinus halepensis* and *Juniperus phoenicis*). **Iharos (1978)**
- 36°07'N, 08°32'E; 450 m asl: Kef Governorate, along road from El Kef and Sakiet, “strongly insolated area”, lichen on soil. **Iharos (1978)**
- 36°22'55"N, 10°07'03"E; 357 m asl: Zaghuan Governorate, Zaghuan, forest, moss on soil. **Gąsiorek et al. (2017)**

Uganda:

- 01°22'N, 32°17'E: Undefined locality. **Murray (1913)**

Zimbabwe:

- 20°30'S, 30°30'E [20°16'S, 30°56'E]; 1,150 m asl: Masvingo Province, Great Zimbabwe, moss or lichen on tree or rock.

Middleton (2003)

- **20°49'S, 30°30'E** [20°30'S, 28°26'E]; *1,400 m asl*: Matabeleland South Province, Matopos, moss or lichen on tree or rock.

Middleton (2003)

Record numbers. Angola: 2, Botswana: 2, Democratic Republic of Congo: 2, Ethiopia: 1, Israel and Palestinian National Authority: 3, Jordan: 1, Kenya: 1, Lesotho: 3, Morocco: 4, Namibia: 1, Republic of South Africa: 9, Somalia: 1, Tunisia: 4, Uganda: 1, Zimbabwe: 2; **total: 37.**

Remarks. For over 150 years *Milnesium* was considered to be a monotypic, highly cosmopolitan genus. However, current research recognises over twenty congeners and suggests that *Milnesium tardigradum* sensu stricto is confined to the Palearctic (see: Michalczyk *et al.* 2012a,b). All African reports of *M. tardigradum* pre-date the re-description of *M. tardigradum* sensu stricto (Michalczyk *et al.* 2012a,b) and therefore these records should be questioned and re-examination using modern taxonomy. Currently, there is no evidence to confirm or deny the presence of *M. tardigradum* s. s. in Africa, and the above list probably represents a number of different *Milnesium* species (Michalczyk *et al.* 2012a,b).

47. *Milnesium tetralamellatum* Pilato & Binda, 1991 [T]

Milnesium tetralamellatum n. sp. (Pilato & Binda 1991)

Milnesium tetralamellatum Pilato & Binda 1991 (Binda & Pilato 1995a)

Terra typica: Tanzania (Africa)

Tanzania:

- *03°09'S, 35°29'E*: **Type Locality:** Undefined locality, Arusha Region, slopes of Ngorongoro Volcano, moss. **Pilato & Binda (1991)**
- *03°12'S, 37°31'E*; **2,200–2,400 m asl**: Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1995a)**

Republic of Zambia:

- *17°55'S, 25°52'E*; **890 m asl**: Southern Province, near Livingstone, in the Victoria Falls gorge, mosses and leaf litter on soil. **Zawierucha *et al.* (2012)**

Record numbers. Tanzania: 2, Republic of Zambia: 1; **total: 3.**

Remarks. This species is currently endemic to Africa and associated (Seychelles) islands (Binda & Pilato 1995b).

Order: Parachela Schuster, Nelson Grigarick & Christenberry, 1980

Superfamily: Hypsibioidea Pilato, 1969

Family: Hypsibiidae Pilato, 1969

Subfamily: Diphasconinae Dastych, 1992

Genus: *Diphascon* Plate, 1888

48. *Diphascon alpinum* Murray, 1906a sensu lato [T]

Diphascon alpinum Murray (Murray 1913)

Diphascon alpinum J. Murray 1906 (Rahm 1936)

Diphascon alpinum (Ramløv & Kristensen 1985)

Terra typica: Scotland (Europe)

Israel and Palestinian National Authority:

- *31°48'N, 35°10'E*; *600 m asl*: Judean Mountains, W of Jerusalem, Motza, extreme arid or semi-arid climate. **Rahm (1936)**
- *31°46'N, 35°10'E*; *650 m asl*: Judean Mountains, Jerusalem, Ein Kerem, extreme arid or semi-arid climate. **Rahm (1936)**
- *31°43'N, 35°17'E*; *600 m asl*: Judean Mountains, al-Ubeidiya, Monastery Deir Dosi (Monastery of St. Theodosius), extreme arid or semi-arid climate. **Rahm (1936)**
- *31°42'N, 35°12'E*; *800 m asl*: Judean Mountains, Bethlehem, extreme arid or semi-arid climate. **Rahm (1936)**

Morocco:

- *32°25'N, 05°13'W*; **1,750 m asl**: Meknès-Tafilalet Region, S of Azrou, cedar forest, forest glade, moss on limestone boulders in the forest glade **Ramløv & Kristensen (1985)**

Uganda:

- *01°22'N, 32°17'E*: Undefined locality. **Murray (1913)**

Record numbers. Israel and Palestinian National Authority: 4, Morocco: 1, Uganda: 1; **total: 6.**

Remarks. The *alpinum* group is a complex of very similar, difficult to discriminate, species (Pilato & Binda 1998). The nominal species is considered rare and probably Palaearctic (Pilato & Binda 1998). All African reports are questionable and require further examination.

49. *Diphascon higginsii* Binda, 1971 [T]

Diphascon higginsii n. sp. (Binda 1971)

Terra typica: Morocco (Africa)

Morocco:

- 31°12'N, 07°52'W; 2,500 m asl [2,600 m asl]: **Type Locality:** Marrakesh-Tansift-Al-Hauz Region, Oukaïmeden, very humid moss. **Binda (1971)**

Record numbers. Morocco: 1; **total: 1.**

Remarks. Belongs to the *nobilei* group in which a few species have been recently described from Europe (Pilato & Bertolani 2005, Pilato *et al.* 2005). *Diphascon higginsii* is largely Palaearctic and all other records need verification.

50. *Diphascon pingue* (Marcus, 1936) *sensu lato* [T]

Diphascon pingue (Marcus 1936) (Binda *et al.* 2001)

Terra typica: Germany (Europe)

Democratic Republic of Congo:

- 01°10'S, 28°28'E; 1,000 m asl: North Kivu Province, outskirts of Mohanga, moss (*Entodon* sp.). **Binda *et al.* (2001)**

Tanzania:

- 03°12'S, 37°31'E; ca. 2,500 m asl: Kilimanjaro Region, Kilimanjaro National Park, Maranda [Mandara] trail, tree line, benthos sample from river. **Van Rompu *et al.* (1991a)**

Tunisia:

- 36°43'45"N, 08°44'11"E; 373 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek *et al.* (2017)**

Record numbers. Democratic Republic of Congo: 1, Tanzania: 1, Tunisia: 1; **total: 3.**

Remarks. The *pingue* group is a complex of similar species (Pilato & Binda 1998, 1999, see Fontoura & Pilato (2007) for diagnostic key). *Diphascon pingue sensu lato* was believed to be cosmopolitan (McInnes 1994a), but the recent revision suggests the nominal species is probably Holarctic (Pilato & Binda 1998, 1999). Some of the African reports could be for *Diphascon pingue sensu stricto*; however, other species from *pingue* group, e.g. *D. zaniiewi* from the Republic of South Africa, have been described from the region.

51. *Diphascon zaniiewi* Kaczmarek & Michalczyk, 2004b [T]

Diphascon (*Diphascon*) *zaniiewi* sp. nov. (Kaczmarek & Michalczyk 2004b)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- 25°21'S, 27°06'E; 1,000 m asl [1,100 m asl]: **Type Locality:** North West Province, Dragon Mountains, Sun City, near waterfall, moss on soil. **Kaczmarek & Michalczyk (2004b)**

Record numbers. Republic of South Africa: 1; **total: 1.**

Remarks. This species is currently endemic to the Republic of South Africa type locale.

Subfamily: Hypsibiinae Pilato, 1969

Genus: *Hypsibius* Ehrenberg, 1848

52. *Hypsibius arcticus* (Murray, 1907c) *sensu lato* [T]

M. arcticus ? Murray (Murray 1907a)

Macrobotus arcticus Murray (Murray 1913)

Terra typica: Franz Josef Land (Russia)

Kenya:

- 01°15'S, 36°41'E; 2,000 m asl: Kiambu County, Kikuyu, moss. **Murray (1913)**

Republic of South Africa:

- 25°45'S, 28°11'E; 1,300 m asl: Gauteng Province, Pretoria, moss. **Murray (1913)**
- 29°44'S, 22°44'E: Undefined locality, Cape Colony [Cape Province]. **Murray (1907a)**

Uganda:

- 01°22'N, 32°17'E: Undefined locality. **Murray (1913)**

Record numbers. Kenya: 1. Republic of South Africa: 2, Uganda: 1; **total: 4.**

Remarks. Described as ‘*arcticus*’ by Murray (1907a; 1913) in both references there is a confusion between the species described as ‘*arcticus*’ and ‘*antarcticus*’. Murray (1907a) reported a single egg, similar to *Macrobotus hastatus* that was smaller but with fewer and thicker rods (i.e. comparing with *Acutuncus antarcticus* egg description) from the Cape Colony. Later Murray (1913) indicated a “supposed egg of this species...” from Uganda (not Cape Colony) and “an animal like the adult of the species...” from Kikuyu. This species confusion and other limited information means the ‘African’ *Hypsibius arcticus* should be considered questionable and requiring verification.

53. *Hypsibius convergens* (Urbanowicz, 1925) *sensu lato* [T]

Hypsibius (*H.*) *convergens* (Urbanowicz), 1925 (Rodriguez-Roda 1947)

Hypsibius convergens (Iharos 1969a)

Hypsibius convergens Urbanowicz, 1925 (Pilato & Pennisi 1976)

Hypsibius convergens Urb. (Iharos 1978)

Hypsibius (*H.*) *convergens* (Urbanowicz, 1928) (Haspeslagh 1982)

Terra typica: Ukraine (Europe)

Algeria:

- 36°38'N, 05°45'E; 1,200 m asl: Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**

Cameroon:

- 04°13'N, 09°10'E; 4,000 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, near fumaroles (80°C), moss on soil. **Iharos (1969a)**
- 04°11'N, 09°12'E; 1,900–1,950 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, primeval forest, above bothy No. 1, moss on trees and lava. **Iharos (1969a)**
- 04°10'N, 09°13'E; 1,300–1,500 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, rainforest, moss on tree. **Iharos (1969a)**

Equatorial Guinea:

- 03°37'N, 08°48'E; 1,800–2,000 m asl: Fernando Póo [Bioko Island], Bioko Norte Province, near refuge at Pico Basilé, on Rubiaceae leaf with liverworts attached. **Rodriguez-Roda (1947)**

Kenya:

- 00°10'S, 37°18'E; 4,270 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Teleki Tarn, small effluent and shallow pond, silt, sediments and sandy gravel. **Haspeslagh (1982)**

Libya:

- 32°49'N, 21°51'E; 600 m asl: Jabal al Akhdar District, Cyrene, moss. **Pilato & Pennisi (1976)**

Republic of South Africa:

- 28°07'S, 27°59'E; 1,000 m asl: Undefined locality, Pretoria Province [Gauteng Province] Dragon Mountains, near waterfall, moss on soil. **Kaczmarek & Michalczyk (2004b)**
- 28°13'S, 31°57'E; 350 m asl: KwaZulu-Natal Province, Hluhluwe-Imfolozi Game Park, lichen on tree (*Acacia*). **Meyer & Hinton (2009)**

Tunisia:

- 36°14'N, 08°46'E; 1,100 m asl: Kef Governorate, 6 km NE of El Kef, Djebel Eddir Mts., surroundings of Ferme Shitta, moss and lichen on rock. **Iharos (1978)**

Record numbers. Algeria: 1, Cameroon: 3, Equatorial Guinea: 1, Kenya: 1, Libya: 1, Republic of South Africa: 2, Tunisia: 1; **total: 10.**

Remarks. *Hypsibius convergens sensu lato* is a species complex (Kaczmarek & Michalczyk 2009) with an apparent global distribution (McInnes 1994). The taxa within this complex require careful examination, and can only be determined via subtle morphometric details of the claws and other characters (e.g. Miller *et al.* 2005, Kaczmarek & Michalczyk 2009). The nominal species of the group is either Palaearctic or Holarctic, so (particularly early) African records require re-examination.

54. *Hypsibius dujardini* (Doyère, 1840) *sensu lato* [F/T]

Hypsibius dujardini (Iharos 1969a)

Hypsibius dujardini (Ramløv & Kristensen 1985)

Hypsibius (*Hypsibius*) *dujardini* (Doyère, 1840) (Séméria 1986)

Hypsibius dujardini (Doyère 1840) (Pilato *et al.* 1991, Pilato *et al.* 2003)

Terra typica: France (Europe)

Algeria:

- 36°40'N, 04°36'E; 1,400 m asl: Tizi Ouzou Province, Akfadou Forest. **Binda & Pilato (1987)**

Cameroon:

- $04^{\circ}13'N$, $09^{\circ}10'E$; **4,000 m asl**: Southwest Region, Mount Cameroon National Park, Mount Cameroon, near fumaroles (80°C), moss on soil. **Iharos (1969a)**

Democratic Republic of Congo:

- $00^{\circ}04'S$, $29^{\circ}18'E$; **1,950 m asl**: North Kivu Province, outskirts of Lukanga, moss (*Brachythecium velutinum*). **Pilato et al. (2003)**
- $01^{\circ}10'S$, $28^{\circ}28'E$; **1,000 m asl**: North Kivu Province, outskirts of Mohanga, mosses (*Campylopus* cfr. *fragilis* and *Brachythecium velutinum*). **Pilato et al. (2003)**
- $34^{\circ}01'S$, $23^{\circ}55'E$; **200 m asl**: Eastern Cape Province, Tzitzikama [Tsitsikamma National Park], moss. **Binda (1984)**

Morocco:

- $33^{\circ}31'N$, $05^{\circ}07'W$; **1,650 m asl**: Meknès-Tafilalet Region, Ras al Ma [Res el Ma], mosses trees (*Cedrus*) and rocks. **Séméria (1986)**
- $32^{\circ}25'N$, $05^{\circ}13'W$; **1,750 m asl**: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on limestone boulders in the forest glade and moss on soil, fallen branches and stems (2 samples). **Ramløv & Kristensen (1985)**

Tanzania:

- $03^{\circ}06'S$, $37^{\circ}20'E$; **ca. 3,850 m asl**: Kilimanjaro Region, Kilimanjaro National Park, upper Kibo, above tree line, rivulet, benthos sample. **Van Rompu et al. (1991a)**
- $03^{\circ}06'S$, $37^{\circ}25'E$; **ca. 4,250 m asl**: Kilimanjaro Region, Kilimanjaro National Park, Kibo trail, below saddle between Kibo and Horombo, above tree line, alpine meadow, small swampy brooklet, benthos sample. **Van Rompu et al. (1991a)**
- $03^{\circ}06'S$, $37^{\circ}25'E$; **ca. 4,250 m asl**: Kilimanjaro Region, Kilimanjaro National Park, Kibo trail, below saddle between Kibo and Horombo, above tree line, alpine meadow, dense vegetation, stagnant water (swamp), benthos sample. **Van Rompu et al. (1991a)**
- $03^{\circ}09'S$, $35^{\circ}29'E$: Undefined locality, Arusha Region, Ngorongoro Volcano, mosses. **Pilato et al. (1991)**
- $03^{\circ}12'S$, $37^{\circ}31'E$; **ca. 2,500 m asl**: Kilimanjaro Region, Kilimanjaro National Park, Maranda [Mandara] trail, tree line, benthos sample from river. **Van Rompu et al. (1991a)**
- $03^{\circ}17'S$, $37^{\circ}31'E$; **ca. 1,500 m asl**: Kilimanjaro Region, Kilimanjaro National Park, Marangu gate, rain forest, below tree line, river, benthos sample. **Van Rompu et al. (1991a)**
- $03^{\circ}17'S$, $37^{\circ}31'E$; **ca. 1,500 m asl**: Kilimanjaro Region, Kilimanjaro National Park, Marangu cascade, foot of cascade, below tree line, benthos sample. **Van Rompu et al. (1991a)**

Record numbers. Algeria: 1, Cameroon: 1, Democratic Republic of Congo: 3, Morocco: 2, Tanzania: 7; **total: 14.**

Remarks. *Hypsibius dujardini sensu lato* is a species complex (Kaczmarek & Michalczyk 2009) with an apparent global distribution (McInnes 1994). Taxa within this complex require careful examination, and can only be determined via subtle details of claw and other morphometric characters (e.g. Miller et al. 2005, Kaczmarek & Michalczyk 2009). The nominal species of the group is Palearctic or Holarctic, and hydrophilic. African records may require closer examination to verify potential new members of this species complex.

55. *Hypsibius maculatus* Iharos, 1969 [T]

Hypsibius maculatus n. sp. (Iharos 1969a)

Terra typica: Cameroon (Africa)

Cameroon:

- $04^{\circ}12'N$, $09^{\circ}12'E$; **2,900–3,000 m asl**; **Type Locality:** Southwest Region, Mount Cameroon National Park, Mount Cameroon, moss on tree and lava blocks. **Iharos (1969a)**

Republic of South Africa:

- $24^{\circ}38'S$, $30^{\circ}51'E$; **1,800 m asl**: Undefined locality, Gauteng or Mpumalanga Province, Dragon Mountains, near the canyon of Blade River, moss on soil. **Kaczmarek & Michalczyk (2004b)**

Record numbers. Cameroon: 1, Republic of South Africa: 1; **total: 2.**

Remarks. Species with uncertain taxonomic position, with some affinities to the genera *Isohypsibius* and *Calohypsibius* (Ramazzotti & Maucci 1983), while the elongate pharyngeal tube could indicate *Hebesuncus*. Currently, this species has been reported from Africa and England (Morgan 1976, McInnes 1994), though the European record requires confirmation.

56. *Hypsibius microps* Thulin, 1928 sensu lato [T]

Terra typica: Sweden (Europe)

Algeria:

- $36^{\circ}40'N$, $04^{\circ}36'E$; **1,400 m asl**: Tizi Ouzou Province, Akfadou Forest. **Binda & Pilato (1987)**
- $36^{\circ}38'N$, $05^{\circ}45'E$; **1,200 m asl**: Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**

Record numbers. Algeria: 2; **total: 2.**

Remarks. A possible species complex, which can be confused with *H. pallidus* and the *Hypsibius convergens-dujardini* complexes (Kaczmarek & Michalczyk 2009). The distribution of *Hypsibius microps sensu lato* is

largely Holarctic (McInnes 1994), but specimens of this group should be examined extremely carefully as they may represent new species.

57. *Hypsibius multituberculatus* Pilato, Binda & Lisi, 2003b [T]

Hypsibius multituberculatus n. sp. (Pilato *et al.* 2003b)

Terra typica: Democratic Republic of Congo (Africa)

Democratic Republic of Congo:

- *01°10'S, 28°28'E; 1,000 m asl*: **Type Locality:** North Kivu Province, outskirts of Mohanga, mosses (*Campylopus* cf. *fragilis* and *Entodon* sp.) and liverwort (*Plagiochila porelloides*). **Pilato *et al.* (2003b)**

Record numbers. Democratic Republic of Congo: 1; **total: 1.**

Remarks. This species is currently endemic Democratic Republic of Congo.

58. *Hypsibius pallidus* Thulin, 1911 [T]

Hypsibius pallidus Thulin (Iharos 1978)

Terra typica: Sweden (Europe)

Tunisia:

- *36°46'N, 08°41'E; 700 m asl*: Jendouba Governorate, surroundings of Ain Draham, moss and lichen on tree (*Quercus sauber*). **Iharos (1978)**

Record numbers. Tunisia: 1; **total: 1.**

Remarks. *Hypsibius pallidus sensu lato* is a possible species complex that can be confused with *H. microps* and species in the *Hypsibius convergens-dujardini* complexes. As such, these species require careful examination. Originally described from Sweden, *Hypsibius pallidus* is a common Holarctic species but also reported from non-European localities (McInnes 1994).

59. *Hypsibius scabropygus* Cuénot, 1929 [T]

Hypsibius (s. str.) *scabropygus* Cuén. [Synonym: *H.* (s. str.) *callimerus* Marc.] (Marcus 1933)

Hypsibius scabropygus Cuénot 1930 (Rahm 1936)

Terra typica: France (Europe)

Algeria:

- *28°02'N, 01°40'E*: Undefined locality, mentioned in, but might be in error for Allier French District. **Rahm (1936)**
- Israel and Palestinian National Authority:
- *31°51'N, 35°25'E; -100 m asl*: near Jericho, St. George's Monastery, Wadi Qelt, extreme arid climate, lichen (*Xanthoria parietina* L.). **Rahm (1936)**

Namibia:

- *21°24'S, 17°14'E; 1,600 m asl [1,450 m asl]*: Otjozondjupa Region, Otjiwarongo between Windhoek and Waterberg. **Marcus (1933)**

Tunisia:

- *36°46'36"N, 08°42'45"E; 784 m asl*: Jendouba Governorate, Beni M'tir, urban, moss on soil. **Çaşıorek *et al.* (2017)**

Record numbers. Algeria: 1, Israel and Palestinian National Authority: 1, Namibia: 1, Tunisia: 1; **total: 4.**

Remarks. Species with wide European distribution, but also recorded from other localities (McInnes 1994). Some possible taxonomic confusion regarding this species were discussed by Zawierucha *et al.* (2014), who suggest some *H. scabropygus* records may belong to other species.

Subfamily: Itaquasconinae Rudescu, 1964

Genus: *Adropion* (Pilato, 1987)

60. *Adropion belgicae* (Richters, 1911) [T]

Diphascon (*Adropion*) *belgicae* Richters, 1911 (Binda & Pilato 1987)

Terra typica: Svalbard (Spitsbergen)

Algeria:

- *36°49'N, 05°47'E; 0 m asl*: Jijel Province, Jijel, Les Aftis beach (Ziama Monsouria). **Binda & Pilato (1987)**
- *36°38'N, 05°45'E; 1,200 m asl*: Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**

Record numbers. Algeria: 2; **total: 2.**

Remarks. Holarctic.

61. *Adropion prorsirostre* (Thulin, 1928) [T]

Terra typica: Scotland (Europe)

Tunisia:

- 36°46'36"N, 08°42'45"E; 784 m asl: Jendouba Governorate, Beni M'tir, urban, moss on soil. **Ğaşıorek et al. (2017)**
- 36°45'47"N, 08°41'09"E; 740 m asl: Jendouba Governorate, Beni M'tir, urban, moss on soil. **Ğaşıorek et al. (2017)**

Record numbers. Tunisia: 2; total: 2.

Remarks. A Holarctic species with reports from single localities in other geographic regions (McInnes 1994), which suggests a species complex.

62. *Adropion scoticum* Murray, 1905b *sensu lato* [T]

D. scoticum Murray (Murray 1913)

H. scoticus (Iharos 1969a)

H. scoticus J. Murr. (Iharos 1978)

Diphascion scoticum Murray, 1905 (Van Rompu et al. 1991a)

Terra typica: Scotland (Europe)

Cameroon:

- 04°11'N, 09°12'E; 1,900–1,950 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, primeval forest, above bothy No. 1, moss on trees and lava. **Iharos (1969a)**
- 04°10'N, 09°13'E; 1,300–1,500 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, rainforest, moss on tree. **Iharos (1969a)**

Republic of South Africa:

- 29°44'S, 22°44'E: Undefined locality, Cape Colony [Cape Province], moss. **Murray (1913)**

Tanzania:

- 03°17'S, 37°31'E; ca. 1,500 m asl: Kilimanjaro Region, Kilimanjaro National Park, Marangu gate, rain forest, below tree line, river, pH 5.5, water temperature 12°C, benthos sample. **Van Rompu et al. (1991a)**

Tunisia:

- 36°07'N, 08°30'E; 350 m asl: Kef Governorate, road between El Kef and Sakiat, 23 km W El Kef, Qued el Kohl, scrub, sparse vegetation, with stony ground and thin layer of surface soil, soil with vegetable debris or litter under trees (*Pinus halepensis* and *Juniperus phoenicis*). **Iharos (1978)**

Record numbers. Cameroon: 2, Republic of South Africa: 1, Tanzania: 1, Tunisia: 1; **total: 5.**

Remarks. *Adropion scoticum sensu lato* is a cosmopolitan complex of very similar species, which can only be determined by careful integrated (morphology and molecular) taxonomy. A re-description of the *A. scoticum sensu stricto* type material is required.

63. *Adropion scoticum ommatophorum* (Thulin, 1911) *sensu lato* [T]

Hypsibius (D.) scoticus (J. Murray) forma *ommatophora* Thulin 1911 (Rodríguez-Roda 1947)

Terra typica: Sweden (Europe)

Equatorial Guinea:

- 03°39'N, 08°49'E; 1,500 m asl: Fernando Póo [Bioko Island], Bioko Norte Province, Pico Basilé, among mosses and liverworts. **Rodríguez-Roda (1947)**

Record numbers. Equatorial Guinea: 1; **total: 1.**

Remarks. Species known from few Holarctic localities and the single tropical African record, which should be considered doubtful and any surviving samples re-examined.

Genus: *Astatumen* Pilato, 1997

64. *Astatumen bartosi* (Węglarska, 1959) *sensu lato* [T]

Astatumen bartosi Węglarska, 1959 (Binda & Pilato 1987)

Terra typica: Poland (Europe)

Algeria:

- 36°46'N, 05°06'E; 400 m asl: Béjaïa Province, Pic des Singes. **Binda & Pilato (1987)**

Record numbers. Algeria: 1; **total: 1.**

Remarks. This rare species, with a largely Palaearctic distribution (McInnes 1994), can be confused with *A. trinacariae* (see Dastyh 1988; Ramazzotti & Maucci 1983). Both species need re-descriptions based on type material or new material from the type locality.

65. *Astatumen trinacriae* (Arcidiacono, 1962) [T]

Itaquascon trinacriae Arcidiacono, 1962 (Binda 1984, Binda & Pilato 1987, Van Rompu *et al.* 1995)

Itaquascon trinacriae (Ramløv & Kristensen 1985)

Terra typica: Italy (Europe)

Algeria:

- 36°38'N, 05°45'E; 1,200 m asl: Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**

Morocco:

- 32°25'N, 05°13'W; 1,750 m asl: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on limestone boulders in the forest glade. **Ramløv & Kristensen (1985)**

Republic of South Africa:

- 34°01'S, 23°55'E; 200 m asl: Eastern Cape Province, Tzitzikama [Tsitsikamma National Park], moss. **Binda (1984)**

Tunisia:

- 36°42'10"N, 08°40'46"E; 462 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek *et al.* (2017)**

Zimbabwe:

- 18°44'S, 26°57'E; 1,100 m asl: Matabeleland North Province, Hwange National Park, near Main Camp, under grass and shrubs, dry sandy soil. **Van Rompu *et al.* (1995)**
- 20°26'S, 28°31'E; 1,350 m asl: Matabeleland South Province, Matobo National Park, Matopos, Moth Shrine, under grass, dry soil. **Van Rompu *et al.* (1995)**
- 20°32'S, 28°28'E; 1,350 m asl: Matabeleland South Province, Matobo National Park, Matopos, Nswatugi Cave, 10 m from the parking, under grass and various trees, dry soil. **Van Rompu *et al.* (1995)**
- 20°33'S, 28°31'E; 1,400 m asl: Matabeleland South Province, Matobo National Park, Matopos, left from the path to Pomongwe Cave, 10 m before the cave, under various trees, dry soil. **Van Rompu *et al.* (1995)**

Record numbers. Algeria: 1, Morocco: 1, Republic of South Africa: 1, Tunisia: 1, Zimbabwe: 4; **total: 8.**

Remarks. The disjunct Holarctic and tropical distribution (McInnes 1994) requires further taxonomic analysis and, as with *A. bartosi*, a revision of the type material and/ or new material from the type locality.

Genus: *Itaquascon* de Barros, 1939

66. *Itaquascon biserovi* Pilato, Binda & Moncada, 1999 [T]

Itaquascon biserovi sp. n. (Pilato *et al.* 1999)

Terra typica: Democratic Republic of Congo (Africa)

Democratic Republic of Congo:

- 01°10'S, 28°28'E; 1,000 m asl: **Type Locality:** North Kivu Province, outskirts of Mohanga, moss. **Pilato *et al.* (1999)**

Record numbers. Democratic Republic of Congo: 1; **total: 1.**

Remarks. This species has not been recorded outside the type locale in the Democratic Republic of Congo.

67. *Itaquascon umbellinae* de Barros, 1939 [T]

Itaquascon umbellinae Barros 1939 (Binda & Pilato 1995a)

Terra typica: Brazil (South America)

Tanzania:

- 03°12'S, 37°31'E; 2,200–2,400 m asl: Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1995a)**

Record numbers. Tanzania: 1; **total: 1.**

Remarks. This highly disjunct distribution, based on a single African specimen (Binda & Pilato 1995a), suggests further taxonomic analysis is required.

Genus: *Mesocrista* Pilato, 1987

68. *Mesocrista spitzbergensis* (Richters, 1903) [T]

Diphascos emmautinum nov. spec. (Rahm 1936)

Terra typica: Svalbard (Spitsbergen)

Jordan:

- 32°02'N, 35°50'E; 950 m asl: Amman Governorate, way to Amman, extreme arid or semi-arid climate. **Rahm (1936)**

Record numbers. Jordan: 1; **total: 1**

Remarks. Due to the limited original description (Rahm 1936), Ramazzotti (1972) considered this a variant of *spitzbergensis*. However, recent analysis of *M. spitzbergensis* and related species (Gąsiorek *et al.* 2016), indicates this is not *spitzbergensis* *sensu stricto*, but could be *Mesocrista revelata* Gąsiorek *et al.*, 2016. Further work is required to clarify this record.

Genus: *Parascon* Pilato & Binda, 1987

69. *Parascon schusteri* Pilato & Binda, 1987 [T]

Parascon schusteri n. sp. (Pilato & Binda 1987)

Terra typica: Tanzania (Africa)

Tanzania:

- 03°09'S, 35°29'E; 2,150 m asl: Arusha Region, east margin Ngorongoro Volcano crater, mosses. **Pilato & Binda (1987)**

Record numbers. Tanzania: 1; **total: 1.**

Remarks. This species has not been reported outside the original type locale in Tanzania.

Genus: *Platicrista* Pilato, 1987

70. *Platicrista angustata* (Murray, 1905a) [T]

Terra typica: Scotland (Europe)

Algeria:

- 36°53'N, 07°39'E; **800 m asl:** Annaba Province, Massif of Eldough [Edough Mountains]. **Binda & Pilato (1987)**

Record numbers. Algeria: 1; **total: 1.**

Remarks. This species is broadly Holarctic (McInnes 1994a; Kaczmarek *et al.* 2016), with a European type locality. Reports from outside this ecozone, e.g. Argentina (see: Kaczmarek *et al.* 2015) would require confirmation.

Subfamily: Pilatobiinae Bertolani, Guidetti, Marchioro, Altiero, Rebecchi & Cesari, 2014

Genus *Pilatobius* Bertolani, Guidetti, Marchioro, Altiero, Rebecchi & Cesari, 2014

71. *Pilatobius bullatus* Murray, 1905b *sensu lato* [T]

Diphascon (*Diphascon*) *bullatum* (Murray, 1905) (Binda & Pilato 1987)

Terra typica: Scotland (Europe)

Algeria:

- 36°46'N, 05°06'E; 400 m asl: Béjaïa Province, Pic des Singes. **Binda & Pilato (1987)**

Tunisia:

- 36°57'N, 08°45'E; 0 m asl: Jendouba Governorate, surroundings of Tabarka. **Binda & Pilato (1987)**

Record numbers. Algeria: 1, Tunisia: 1; **total: 2.**

Remarks. Widely distributed (McInnes 1994a), possibly representing a species complex that will require re-examination of the type locale material.

72. *Pilatobius granifer* (Greven, 1972) [T]

Diphascon granifer Greven, 1972 (Pilato & Pennisi 1976)

Terra typica: Germany (Europe)

Libya:

- 32°29'N, 20°50'E; 350 m asl: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Record numbers. Libya: 1; **total: 1.**

Remarks. A rare species from Europe, Africa and North America (McInnes 1994, Kaczmarek *et al.* 2016).

73. *Pilatobius patanei* (Binda & Pilato, 1971a) [T]

Terra typica: Italy (Europe)

Tunisia:

- **36°46'36"N, 08°42'45"E; 784 m asl:** Jendouba Governorate, Beni M'tir, urban, moss on soil. **Gąsiorek *et al.* (2017)**

Record numbers. Tunisia: 1; **total: 1.**

Remarks. Previously recorded from several Mediterranean sites (McInnes 1994); a recent Asian report may require confirmation (see: Gąsiorek *et al.* 2017).

Family: Microhypsibiidae Pilato, 1998

Genus: *Fractonotus* Pilato, 1998

74. *Fractonotus caelatus* (Marcus, 1928) [T]

Hypsibius ornatus f. *caelata* (Iharos 1969a)

Terra typica: Ireland (Europe)

Cameroon:

- **04°11'N, 09°12'E; 1,950–2,050 m asl:** Southwest Region, Mount Cameroon National Park, Mount Cameroon, south side, grassy lava field and area of the timberline by trees and lava. **Iharos (1969a)**

Record numbers. Cameroon: 1; **total: 1.**

Remarks. This monotypic genus with a broad Palaearctic/ Australian/ South American distribution (Pilato *et al.* 1989, 2003a), could suggest a grouping of several species with low morphological divergence. Further research is required to elucidate this hypothesis.

***Incerta subfamilia* {according to Bertolani *et al.* 2014}**

Genus: *Acutuncus* Pilato & Binda, 1997

75. *Acutuncus antarcticus* (Richters, 1904d) *sensu lato* [T/F]

Hypsibius cf. *antarcticus* (Richters, 1904) (Van Rompu *et al.* 1991a)

Terra typica: Gaussberg, Wilhelm II Land (Antarctica)

Tanzania:

- **03°17'S, 37°31'E; ca. 1,500 m asl:** Kilimanjaro Region, Kilimanjaro National Park, Marangu gate, rain forest, below tree line, river benthos sample. **Van Rompu *et al.* (1991a)**

Record numbers. Tanzania: 1; **total: 1.**

Remarks. The description in Van Rompu *et al.* (1991a), was based on a single specimen displaying a deformed pharyngeal bulb with the macroplacoids and microplacoid situated towards the anterior of the bulb. Such a description had been thought to indicate the species '*antarcticus*' but was subsequently recognised as either pre-simplex form or a mounting anomaly (Dastych 1991). The presence of a microplacoid indicates this was not *Acutuncus antarcticus* but was probably a *Hypsibius* spp. Therefore, the actual presence of *Acutuncus antarcticus* in Africa needs to be confirmed.

Family: Ramazzottiidae Sands, McInnes, Marley, Goodall-Copestake, Convey & Linse, 2008

Genus: *Ramazzottius* Binda & Pilato, 1986

76. *Ramazzottius libycus* Pilato, D'Urso & Lisi, 2013 [T]

Hypsibius oberhaeuseri Doyère, 1840 (Pilato & Pennisi 1976)

Ramazzottius libycus sp. nov. (Pilato *et al.* 2013)

Terra typica: Libya (Africa)

Libya:

- **32°29'17"N, 20°50'19"E; 350 m asl:** **Type Locality:** Marj District, Barce [Marj], in the neighbourhood of the town; moss. **Pilato & Pennisi (1976), Pilato *et al.* (2013)**

Record numbers. Libya: 1; **total: 1.**

Remarks. This recently described species has not been reported outside the type locale in Libya.

77. *Ramazzottius oberhaeuseri* (Doyère, 1840) sensu lato [T]

Macrobotus oberhäuseri Doy. (Murray 1913)

Hypsibius oberhäseri Doyère, 1840 (Rahm 1936)

Hypsibius oberhaeuseri C.G. Ehrenberg, 1848 (Teunissen 1938)

Hypsibius oberhäuseri (Doyère) 1840 (da Cunha & do Nascimento 1964)

H. (H.) oberhäuseri (Doyère, 1840) (Séméria 1986)

Terra typica: Germany (Europe)

Angola:

- 14°55'S, 13°30'E; 1,750 m asl: Huíla Province, surroundings of Sá da Bandeira [Lubango], lichens. **da Cunha & do Nascimento (1964)**

Israel and Palestinian National Authority:

- 32°41'N, 35°23'E; 550 m asl: Tavor Mountain Reserve, Tabor Mt., extreme arid climate or semi-arid climate, moss (*Barbula* sp.?). **Rahm (1936)**
- 32°13'N, 35°16'E; 550 m asl: Judean Mountains, Samaria, Nablus, extreme arid climate or semi-arid climate, moss (*Barbula* sp.?). **Rahm (1936)**
- 32°05'N, 34°53'E; 50 m asl: Petah Tikva, humid climate, lichen. **Rahm (1936)**
- 31°47'N, 35°13'E; 800 m asl: Judean Mountains, Jerusalem, wall of Abyssinian [Ethiopian] Church, extreme arid climate or semi-arid climate, moss (*Barbula* sp.?). **Rahm (1936)**
- 31°47'N, 35°14'E; 750 m asl: Judean Mountains, Jerusalem, City Wall of Jerusalem, Damascus Gate, extreme arid climate or semi-arid climate, moss (*Barbula* sp.?). **Rahm (1936)**
- 31°47'N, 35°15'E; 800 m asl: Judean Mountains, Jerusalem, Olives Mt., Pater Noster church, Russians tower, wall of church, extreme arid climate or semi-arid climate, moss (*Barbula* sp.?). **Rahm (1936)**
- 31°46'N, 35°14'E; 750 m asl: Judean Mountains, Jerusalem, Zion Mt., wall behind the Church of Zion, extreme arid climate or semi-arid climate, moss (*Barbula* sp.?). **Rahm (1936)**
- 31°46'N, 35°16'E; 650 m asl: Judean Mountains, al-Eizariya, Bethany, Tomb of Lazarus, rock, extreme arid climate or semi-arid climate, moss (*Barbula* sp.?). **Rahm (1936)**
- 31°41'N, 35°10'E; 800 m asl: Judean Mountains, Solomon's Pools, extreme arid climate or semi-arid climate, moss (*Barbula* sp.?). **Rahm (1936)**
- 31°32'N, 35°06'E; 950 m asl: Judean Mountains, Hebron, extreme arid climate or semi-arid climate, moss (*Barbula* sp.?). **Rahm (1936)**
- 31°32'N, 35°06'E; 950 m asl: Judean Mountains, Hebron, Abraham's Oak, extreme arid climate or semi-arid climate, moss (*Barbula* sp.?). **Rahm (1936)**

Jordan:

- 31°50'N, 36°49'E; 500 m asl: Zarqa Governorate, Zarqa [Azarq Wetland Reserve], moss. **Kaczmarek & Michalczyk (2004a)**

Kenya:

- 00°01'S, 37°54'E: Undefined locality, British East Africa [Kenya], moss. **Murray (1913)**

Morocco:

- 33°31'N, 05°07'W; 1,650 m asl: Meknès-Tafilalet Region, Ras al Ma [Res el Ma], mosses trees (*Cedrus*) and rocks. **Séméria (1986)**
- 33°27'N, 05°13'W; 1,250 m asl: Meknès-Tafilalet Region, ca. 30 [60] km S of Meknes, Azrou, lichens. **Séméria (1986)**

Republic of South Africa:

- 25°45'S, 28°11'E; 1,300 m asl: Gauteng Province, Pretoria, moss. **Murray (1913)**

Rwanda:

- 01°30'S, 29°32'E; 2,400 m asl: Northern Province, Albert National Park [Volcanoes National Park], Kibga, S slope of the volcano Visoke, at the edge of a bamboo forest, soil. **Teunissen (1938)**

Uganda:

- 01°22'N, 32°17'E: Undefined locality, moss. **Murray (1913)**

Record numbers. Angola: 1; Israel and Palestinian National Authority: 11, Jordan: 1, Republic of South Africa: 1, Rwanda: 1, Kenya: 1, Morocco: 2, Uganda: 1; **total: 19.**

Remarks. *Ramazzottius oberhaeuseri* is a species complex with a cosmopolitan distribution (McInnes 1994, see also Pilato *et al.* 2013). Recent papers have begun to identify individual species (see: Degma *et al.* 2009–2016), though most require the presence of eggs (see Biserov 1998 for a diagnostic key to the genus). The presence of *R. oberhaeuseri* in Africa remains unconfirmed. Some North African specimens may belong to the recently described *R. libycus* (see above) or another *Ramazzottius* species. Murray (1913), briefly reported specimens from Uganda and Kenya, which he described as, “strongly papillose over the whole body, and brightly coloured, varying from the typical madder brown to vivid purple”. We suggest these specimens do not belong to the nominal *R. oberhaeuseri* but may represent *R. szeptycki*.

78. *Ramazzottius szeptycki* (Dastych, 1980) [T]

Ramazzottius szeptyckii (Dastych, 1980) (Van Rompu *et al.* (1991a)

Ramazzottius szeptycki (Dastych 1980) (Pilato *et al.* 1991, Binda & Pilato 1995a)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- 25°11'S, 30°46'E; **ca. 1,400 m asl: Type Locality:** Mpumalanga Province, Hendriksdaal, ravine of Palmer's Creek, moss on rock. **Dastych (1980)**
- 28°57'S, 29°11'E; **1,600 m asl:** KwaZulu-Natal Province, Drakensberg Mountains, Cathedral Peak area, Indumeni Forest, moss on rock. **Dastych (2009)**
- 29°18'S, 30°14'E; **1,300 m asl:** KwaZulu-Natal Province, Karkloof Nature Reserve, Rockwood House, mosses and lichens on tree. **Dastych (2009)**

Tanzania:

- 03°09'S, 35°29'E: Undefined locality, Arusha Region, Ngorongoro Volcano, mosses. **Pilato *et al.* (1991)**
- 03°12'S, 37°31'E; **2,200–2,400 m asl:** Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1995a)**
- 03°17'S, 37°31'E; **ca. 1,500 m asl:** Kilimanjaro Region, Kilimanjaro National Park, Marangu gate, rain forest, below tree line, river, benthos sample. **Van Rompu *et al.* (1991a)**

Record numbers. Republic of South Africa: 3, Tanzania: 3; **total: 6.**

Remarks. This species has a limited distribution in southern and eastern Africa.

79. *Ramazzottius theroni* Dastych, 1993 [T]

Ramazzottius theroni sp. n. (Dastych 1993)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- 28°13'S, 31°57'E; **350 m asl:** KwaZulu-Natal Province, Hluhluwe-Imfolozi Game Park, lichen on tree (*Acacia*). **Meyer & Hinton (2009)**
- 33°56'S, 20°03'E; **195 m asl: Type Locality:** Western Cape Province, SW Cape, *ca.* 4 km W Bonnievale, S and N slopes of Rooiberg, lichens on steams of various Karoo-bushes. **Dastych (1993)**

Record numbers. Republic of South Africa: 2; **total: 2.**

Remarks. Currently endemic to the Republic of South Africa.

Superfamily: Isohypsibioidea Sands, McInnes, Marley, Goodall-Copestake, Convey & Linse, 2008

Family: Isohypsibiidae Sands, McInnes, Marley, Goodall-Copestake, Convey & Linse, 2008

Genus: *Apodibius* Dastych, 1983

80. *Apodibius nuntius* Binda, 1984 [T]

Apodibius nuntius n. sp. (Binda 1984)

Terra typica: Mozambique (Africa)

Mozambique:

- 23°52'S, 35°23'E; **0 m asl: Type Locality:** Inhambene Province, Inhambene, very muddy moss. **Binda (1984)**

Zimbabwe:

- 17°46'S, 31°03'E; **1 500 m asl:** Harare City, Tobacco Research Board, nematology seed bed site, under grass, dry soil. **Van Rompu *et al.* (1995)**
- 18°20'S, 26°28'E; **700 m asl:** Matabeleland North Province, 370 km from Bulawayo, beyond Hwange village, along the road to Livingstone, mopane forest, dry soil. **Van Rompu *et al.* (1995)**
- 18°35'S, 25°55'E; **1,050 m asl:** Matabeleland North Province, Hwange National Park, *ca.* 10 km from Robbin's Camp near Chingahali dam, under grass and mopane trees along the dry river bed, dry soil. **Van Rompu *et al.* (1995)**
- 18°56'S, 27°46'E; **1,000 m asl:** Matabeleland North Province, 182 km from Bulawayo alongside the road to Hwange, Lupane, around a tree, dry sandy soil with some organic debris. **Van Rompu *et al.* (1995)**
- 20°31'S, 29°21'E; **1,100 m asl:** Matabeleland South Province, right side of the road from Masvingo to Bulawayo, 175 km from Masvingo, under shrubs and mopane tree, dry soil. **Van Rompu *et al.* (1995)**
- 21°27'S, 32°04'E; **200 m asl:** Masvingo Province, Gonaredzhou National Park [South Gonaredzhou National Park], Mwatambo viewpoint, under grass and shrubs, dry soil. **Van Rompu *et al.* (1995)**

Record numbers. Mozambique: 1; Zimbabwe: 6; **total: 7.**

Remarks. This species from soil habitats has a south eastern African distribution.

Genus: *Doryphoribius* Pilato, 1969

81. *Doryphoribius bindae* Lisi, 2011 [T]

Doryphoribius citrinus (Maucci, 1972) (Binda 1984)

Doryphoribius bindae sp. nov. (Lisi 2011)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- **34°01'S, 23°55'E; 200 m asl:** Eastern Cape Province, Tzitzikama [Tsitsikamma National Park], moss. **Binda (1984), Lisi (2011)**

Record numbers. Republic of South Africa: 1; **total: 1.**

Remarks. This species is currently endemic to the Republic of South Africa.

82. *Doryphoribius doryphorus* (Binda & Pilato, 1969a) [F]

Terra typica: Italy (Europe)

Libya:

- **32°29'N, 20°50'E; 350 m asl:** Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Record numbers. Libya: 1; **total: 1.**

Remarks. The disjunct distribution (McInnes 1994a), suggests the African record needs verification, especially in the light of numerous recently described *Doryphoribius* species (see Degma *et al.* 2009–2016 and key in Michalczyk & Kaczmarek 2010).

83. *Doryphoribius flavus* (Iharos, 1966a) [T]

Hypsibius flavus (Iharos 1969a)

Terra typica: Hungary (Europe)

Cameroon:

- **04°11'N, 09°12'E; 1,900–1,950 m asl:** Southwest Region, Mount Cameroon National Park, Mount Cameroon, primeval forest, above bothy No. 1, moss on trees and lava. **Iharos (1969a)**
- **04°10'N, 09°13'E; 1,300–1,500 m asl:** Southwest Region, Mount Cameroon National Park, Mount Cameroon, rainforest, moss on tree. **Iharos (1969a)**

Record numbers. Cameroon: 2; **total: 2.**

Remarks. This disjunct distribution (McInnes 1994a) and a recent discussion on the synonymy of *Doryphoribius flavus* and *Doryphoribius citrinus* by Lisi (2011) confirmed the need to re-examine older reports. Lisi (2011) stated, “(...) the records of *D. flavus* in South America, in South Africa and in Bali are incorrect. This means the geographic distribution of *D. flavus* requires re-evaluation (...)”.

84. *Doryphoribius maranguensis* Binda & Pilato, 1995a [T]

Doryphoribius maranguensis n. sp. (Binda & Pilato 1995a)

Terra typica: Tanzania (Africa)

Tanzania:

- **03°12'S, 37°31'E; 2,200–2,400 m asl: Type Locality:** Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1995a)**

Record numbers. Tanzania: 1; **total: 1.**

Remarks. This species has not been reported outside the type locale in Tanzania.

85. *Doryphoribius maasaimarensis* Fontoura, Lisi & Pilato, 2013 [T]

Doryphoribius maasaimarensis sp. nov. (Fontoura *et al.* 2013)

Terra typica: Kenya (Africa)

Kenya:

- **01°31'46.49''S, 35°19'04.84''E; 1,780 m asl: Type Locality:** Narok County, Sarova Mara Game Camp, rolling plains of the savannah, moss on tree. **Fontoura *et al.* (2013)**

Record numbers. Kenya: 1; **total: 1.**

Remarks. This recently described species has not been reported outside the type locale in Kenya.

86. *Doryphoribius niedbalai* Zawierucha, Michalczyk & Kaczmarek, 2012 [T]

Doryphoribius niedbalai n. sp. (Zawierucha *et al.* 2012)

Terra typica: Republic of Zambia (Africa)

Republic of Zambia:

- 17°55'S, 25°52'E; 890 m asl: **Type Locality:** Southern Province, near Livingstone, in the Victoria Falls gorge, mosses and leaf litter on soil. **Zawierucha et al. (2012)**

Record numbers. Republic of Zambia: 1; **total: 1.**

Remarks. This recently described species has not been reported outside the type locale in the Republic of Zambia.

Genus: *Eremobiotus* Biserov, 1992

87. *Eremobiotus alicatai* (Binda, 1969) [T]

Isohypsibius alicatai Binda, 1969 (Pilato & Pennisi 1976)

Terra typica: Italy (Europe)

Libya:

- 32°46'N, 22°38'E; 0 m asl: Derna District, Derna, moss. **Pilato & Pennisi (1976)**

Record numbers. Libya: 1; **total: 1.**

Remarks. Recorded from a few Palaearctic localities.

Genus: *Haplohexapodibius* Pilato & Beasley, 1987

88. *Haplohexapodibius seductor* Pilato & Beasley, 1987 [T]

Terra typica: Oklahoma, USA (North America)

Republic of South Africa:

- 29°30'S, 29°19'E: Undefined locality, KwaZulu-Natal Province, Drakensberg Mountains [Dragon Mountains] moss. **Kaczmarek et al. (2006)**

Record numbers. Republic of South Africa: 1; **total: 1.**

Remarks. A rare species with a disjunct distribution including Chile (*locus typicus*), USA, and South Africa (Kaczmarek et al. 2006).

Genus: *Hexapodibius* Pilato, 1969

89. *Hexapodibius bindae* Pilato, 1982 [T]

Hexapodibius bindae n. sp. (Pilato 1982)

Terra typica: Algeria (Africa)

Algeria:

- 34°48'N, 06°42'E; 150 m asl: **Type Locality:** Biskra Province, 30 km NE from El Oued oasis [Zeribet el Oued], on the way to Toyeur, fine sand at the base of grass. **Pilato (1982)**
- 34°40'N, 06°11'E; 0 m asl: Biskra Province, 30 km from Biskra, El Oued [Zeribet el Oued]. **Binda & Pilato (1987)**

Record numbers. Algeria: 2; **total: 2.**

Remarks. This species has a limited distribution including Algeria and Hungary (Vargha 1995; 1996; 1998, Vargha & Iharos 2001).

Genus: *Isohypsibius* Thulin, 1928

90. *Isohypsibius arbiter* Binda, 1980 [T]

Isohypsibius arbiter Binda 1980 (Binda et al. 2001)

Terra typica: Italy (Europe)

Algeria:

- 36°40'N, 04°36'E; 1,400 m asl: Tizi Ouzou Province, Akfadou Forest. **Binda & Pilato (1987)**
- 36°38'N, 05°45'E; 1,200 m asl: Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**

Democratic Republic of Congo:

- 00°04'S, 29°18'E; 1,950 m asl: North Kivu Province, outskirts of Lukanga, moss (*Brachythecium velutinum*). **Binda et al. (2001)**

Record numbers. Algeria: 2; Democratic Republic of Congo: 1; **total: 3.**

Remarks. Reported from Europe, Russia, North America and Africa (McInnes 1994, Kaczmarek *et al.* 2016), suggesting a broadly Holarctic distribution.

91. *Isohypsibius asper* (Murray, 1906b) [T]

I. tetradactyloides (Ramløv & Kristensen 1985)

Terra typica: Crozet Archipelago (South Indian Ocean)

Ivory Coast:

- 07°24'N, 07°33'W; 400 m asl: Tonkpi Region, above Man, the Ko, just above the water line of a mountain stream, wet moss on rocks. **Marcus (1933)**

Morocco:

- 31°35'N, 05°36'W; 1,650 m asl: Souss-Massa-Drâa Region, Todra [Todgha] Gorge, moss from running water (source at the hotel). **Ramløv & Kristensen (1985)**

Record numbers. Ivory Coast: 1, Morocco: 1; **total: 2.**

Remarks. Dastych (2016) has re-described *I. tetradactyloides* (Richters, 1907b) as the junior synonym of *I. asper* (Murray, 1906b). Dastych (2016) noted that the Marcus (1936) had dropped the original Richters' (1907b) figures in favour of figures based on his Ivory Coast (Marcus 1933) and previously unpublished Hartz Mts., Germany (Marcus 1936) specimens, which has influenced the understanding and interpretation of *I. tetradactyloides* of following tardigradologists.

92. *Isohypsibius austriacus* (Iharos, 1966b) [T]

Isohypsibius austriacus Iharos, 1966 (Pilato & Pennisi 1976)

Terra typica: Austria (Europe)

Algeria:

- 36°46'N, 05°06'E; 400 m asl: Béjaïa Province, Pic des Singes. **Binda & Pilato (1987)**

Libya:

- 32°29'N, 20°50'E; 350 m asl: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Record numbers. Algeria: 1, Libya: 1; **total: 2.**

Remarks. Recorded from only few localities in Europe and Africa (McInnes 1994), suggesting a Palaearctic distribution.

93. *Isohypsibius brevispinosus* (Iharos, 1966a) [T]

I. brevispinosus (Ramløv & Kristensen 1985)

Terra typica: Hungary (Europe)

Morocco:

- 32°25'N, 05°13'W; 1,750 m asl: Meknès-Tafilalet Region, S of Azrou, cedar forest, mosses on basalt and limestone boulders in the forest glade (2 samples). **Ramløv & Kristensen (1985)**

Record numbers. Morocco: 1; **total: 1.**

Remarks. The limited species diagnostics and similarity with *I. sattleri* requires a modern taxonomic revision (Ramazzotti & Maucci 1983). Also reported from two localities in Europe and one (uncertain) in South America (McInnes 1994, Kaczmarek *et al.* 2015).

94. *Isohypsibius brulloi* Pilato & Pennisi, 1976 [T]

Isohypsibius brulloi n. sp. (Pilato & Pennisi 1976)

I. brulloi (Ramløv & Kristensen 1985)

Terra typica: Libya (Africa)

Libya:

- 32°29'N, 20°50'E; 350 m asl: **Type Locality:** Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Morocco:

- 32°25'N, 05°13'W; 1,750 m asl: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on basalt boulders in the forest glade. **Ramløv & Kristensen (1985)**

Record numbers. Libya: 1, Morocco: 1; **total: 2.**

Remarks. A disjunct distribution from Africa and Costa Rica suggesting this is a rarely observed species, evidence of anthropogenic (?) transport, and/ or that the examples from Costa Rica represent a new species which should be re-examined (Kaczmarek *et al.* 2015).

95. *Isohypsibius cameruni* (Iharos, 1969) [T]

Hypsibius cameruni n. sp. (Iharos 1969a)

Terra typica: Cameroon (Africa)

Cameroon:

- *04°11'N, 09°12'E; 1,900–1,950 m asl: Type Locality:* Southwest Region, Mount Cameroon National Park, Mount Cameroon, primeval forest, above bothy No. 1, moss on trees and lava. **Iharos (1969)**

Record numbers. Cameroon: 1; **total: 1.**

Remarks. Rare species only reported from localities in Australia, Cameroon, Japan and New Zealand (Pilato *et al.* 1991, McInnes 1994, Ito 1995). Horning *et al.* (1978) suggested that some identifications of this species were doubtful but Pilato & Binda (1997) later confirmed some were correctly identified. The records of this species could suggest a subtropical distribution.

96. *Isohypsibius deconincki* Pilato, 1971 [F/T]

Terra typica: Italy (Europe)

Algeria:

- *36°38'N, 05°45'E; 1,200 m asl:* Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**

Republic of South Africa:

- *26°57'S, 32°51'E; 0 m asl:* KwaZulu-Natal Province, Kosi, topsoil. **Binda (1984)**

Record numbers. Algeria: 1, Republic of South Africa: 1; **total: 2.**

Remarks. Recorded from a few disjunct localities in Africa, Europe and North America (McInnes 1994, Bartels & Nelson 2007).

97. *Isohypsibius elegans* Binda & Pilato, 1971b *sensu lato* [T]

Terra typica: Italy (Europe)

Algeria:

- *36°53'N, 07°39'E; 800 m asl:* Annaba Province, Massif of Eldough [Edough Mountains]. **Binda & Pilato (1987)**
- *36°46'N, 05°06'E; 400 m asl:* Béjaïa Province, Pic des Singes. **Binda & Pilato (1987)**

Libya:

- *32°46'N, 22°38'E; 0 m asl:* Derna District, Derna, moss. **Pilato & Pennisi (1976)**
- *32°29'N, 20°50'E; 350 m asl:* Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Tunisia:

- *36°57'N, 08°45'E; 0 m asl:* Jendouba Governorate, surroundings of Tabarka. **Binda & Pilato (1987)**
- *36°50'N, 10°19'E; 0 m asl:* Tunis Governorate, Salamambo. **Binda & Pilato (1987)**
- **36°46'36"N, 08°42'45"E; 784 m asl:** Jendouba Governorate, Beni M'tir, urban, moss on soil. **Çaşıorek *et al.* (2017)**
- *36°46'N, 08°41'E; 650 m asl:* Jendouba Governorate, surroundings of Ain Draham [Ayn Drahim]. **Binda & Pilato (1987)**
- **36°44'21"N, 08°43'47"E; 516 m asl:** Jendouba Governorate, Beni M'tir, forest, moss on soil. **Çaşıorek *et al.* (2017)**

Record numbers. Algeria: 2, Libya: 2, Tunisia: 5; **total: 9.**

Remarks. The nominal species for a group of morphologically similar species requiring very carefully examination, especially in terms of claw structure and cuticle sculpture, to ensure correct identification (Pilato *et al.* 1982). Recorded from the Palaearctic, Canada and Australia (Jørgensen & Kristensen 1991, McInnes 1994, Van Rompu *et al.* 2000)

98. *Isohypsibius granulifer* Thulin, 1928 *sensu lato* [F]

Hypsibius (I.) granulifer Thulin, 1928 (Haspelslagh 1982)

Terra typica: Sweden (Europe)

Ivory Coast:

- *06°51'N, 06°27'W; 250 m asl:* Haut-Sassandra Region, between the rivers Bandama and Sassandra, Daloa (road to Issia), pond in the jungle. **Marcus (1933)**

Kenya:

- *00°09'S, 37°18'E; 4,345 m asl:* Nyeri County, Mount Kenya National Park, Mount Kenya, Oblong Tarn, shore, sediments and gravel. **Haspelslagh (1982)**
- *00°09'S, 37°18'E; 4,485 m asl:* Nyeri County, Mount Kenya National Park, Mount Kenya, Nanyuki Tarn, shore, silt with plant debris and sandy gravel. **Haspelslagh (1982)**
- *00°09'S, 37°19'E; 4,439 m asl:* Meru County, Mount Kenya National Park, Mount Kenya, Lower Kami Tarn, shore, sediments. **Haspelslagh (1982)**
- *00°10'S, 37°18'E; 4,270 m asl:* Nyeri County, Mount Kenya National Park, Mount Kenya, Teleki Tarn, small effluent and shallow pond, silt, sediments and sandy gravel. **Haspelslagh (1982)**
- *00°10'S, 37°19'E; 4,310 m asl:* Meru County, Mount Kenya National Park, Mount Kenya, Upper Thompson Tarn, shore,

sediments. **Haspelslagh (1982)**

Record numbers. Ivory Coast: 1; Kenya: 5; **total: 6.**

Remarks. The Holarctic distribution of this species suggests the single locality in Brazil (Kaczmarek *et al.* 2014) and the African records could belong to another species. The original species description (Thulin 1928) requires a modern re-description of type material.

99. *Isohypsibius indicus* (Murray, 1907d) *sensu lato* [T]

Macrobotus indicus (Murray 1913)

Terra typica: India (Asia)

Kenya:

- 00°01'S, 37°54'E: Undefined locality, British East Africa [Kenya], moss. Murray (1913)

Record numbers. Kenya: 1; **total: 1.**

Remarks. Originally described from Himalayas (Murray 1907) as a *tuberculatus* type. This report from Africa is for a single specimen in simplex stage, with a note that the claws were slightly different (Murray 1913). We regard this African report as doubtful.

100. *Isohypsibius kristenseni* Pilato, Catanzaro & Binda, 1989 [F/T]

Isohypsibius kristenseni Pilato, Catanzaro & Binda 1989 (Pilato *et al.* 1991)

Terra typica: Italy (Europe)

Mozambique:

- 23°52'S, 35°23'E; 0 m asl: Inhambene Province, Inhambene, soil. **Pilato *et al.* (1991)**

Record numbers. Mozambique: 1; **total: 1.**

Remarks. Only been recorded from Italy and Mozambique.

101. *Isohypsibius lunulatus* (Iharos, 1966a) [T]

Isohypsibius lunulatus (Iharos 1966) (Binda *et al.* 2001)

Terra typica: Hungary (Europe)

Algeria:

- 36°53'N, 07°39'E; **800 m asl:** Annaba Province, Massif of Eldough [Edough Mountains]. **Binda & Pilato (1987)**
- 36°40'N, 04°36'E; **1,400 m asl:** Tizi Ouzou Province, Akfadou Forest. **Binda & Pilato (1987)**

Democratic Republic of Congo:

- 00°04'S, 29°18'E; 1,950 m asl: North Kivu Province, outskirts of Lukanga, moss (*Brachythecium velutinum*). **Binda *et al.* (2001)**

Record numbers. Algeria: 2, Democratic Republic of Congo: 1; **total: 3.**

Remarks. A Holarctic distribution (McInnes 1994), with a few exceptions (Kaczmarek *et al.* 2015).

102. *Isohypsibius macrodactylus* (Maucci, 1978) [T]

Isohypsibius zierhofferi Dastych, 1979 (Binda & Pilato 1987)

Terra typica: Turkey (Europe)

Algeria:

- 36°28'N, 04°14'E; **1,700 m asl:** Tizi Ouzou Province, Massif of Djurdjura (Assouille depression). **Binda & Pilato (1987)**

Record numbers. Algeria: 1; **total: 1.**

Remarks. A rarely reported species recorded from (largely Palaearctic) disjunct localities (McInnes 1994), suggesting specific habitats requirements or a species complex.

103. *Isohypsibius malawiensis* Jørgensen, 2001 [F]

Isohypsibius malawiensis sp. n. (Jørgensen 2001)

Terra typica: Malawi (Africa)

Malawi:

- 13°45'S, 34°37'E [13°43'S, 34°37'E]; 500 m asl: Salima District, shore of Malawi Lake, Singa [Senga], beach in front of Safari Beach Lodge, clean coarse sand (1 m depth). **Jørgensen (2001)**

Record numbers. Malawi: 1; **total: 1.**

Remarks. A newly described species currently endemic to Malawi.

104. *Isohypsibius nodosus* (Murray, 1907a) [T]

M. nodosus sp. n. (Murray 1907a)

Hypsibius (Isohypsibius) nodosus (Murray). (Pardi 1941)

Terra typica: Republic of South Africa (Africa)

Ethiopia:

- 04°03'N, 38°19'E; 1,700 m asl: Oromia Region, Mēga, moss (*Neckera* sp.) on tree (*Juniperus procera*), former English residence, moss on tree (*Juniperus procera*) (2 samples). **Pardi (1941)**

Kenya:

- 00°01'S, 37°54'E: Undefined locality, British East Africa [Kenya], moss. **Murray (1913)**

Republic of South Africa:

- 25°45'S, 28°11'E; 1,300 m asl: Gauteng Province, Pretoria, moss. **Murray (1913)**
- 29°44'S, 22°44'E: **Type Locality:** Undefined locality, Cape Colony [Cape Province]. **Murray (1907a)**

Uganda:

- 01°22'N, 32°17'E: Undefined locality, moss. **Murray (1913)**

Record numbers. Ethiopia: 2, Kenya: 1, Republic of South Africa: 2, Uganda: 1; **total: 6.**

Remarks. Reported from a limited number of pan-global sites (McInnes 1994), indicative of a possible species complex. Interestingly, Murray (1913) (referring to the cuticle) specified for the specimens from Kenya, “The knobs are very prominent, yet smaller than in the type. In the type they are so large that they occupy the whole surface of the segments and meet at their bases. These are only about half the diameter, and are separated at their bases.” Pardi (1941) also indicated smaller separated nodules. Further study of type material is required to clarify the identity of species attributed to this taxon.

105. *Isohypsibius papillifer* (Murray, 1905b) sensu lato [F]

Terra typica: Scotland (Europe)

Tanzania:

- 03°08'S, 37°26'E; ca. 3,900 m asl: Kilimanjaro Region, Kilimanjaro National Park, Kibo trail, above tree line, ice covered puddle, depth 2 cm, benthos sample. **Van Rompu et al. (1991a)**

Record numbers. Tanzania: 1; **total: 1.**

Remarks. This species complex has been reported from a limited number of global sites (McInnes 1994). Further study of type material (Morgan 1977) is required to verify the species in Africa.

106. *Isohypsibius papillifer bulbosus* (Marcus, 1928) sensu lato [F]

Terra typica: Ireland (Europe)

Tanzania:

- 03°07'S, 37°21'E; ca. 4,000 m asl: Kilimanjaro Region, Kilimanjaro National Park, Barranco trail, above tree line, slow running ice covered brooklet, benthos sample. **Van Rompu et al. (1991a)**

Record numbers. Tanzania: 1; **total: 1.**

Remarks. With a largely Palaearctic distribution (McInnes 1994) this subspecies requires modern taxonomic analysis of type material to identify whether it is a de facto species (sensu Murray 1911).

107. *Isohypsibius pappi* (Iharos, 1966a) [T]

I. pappi (Ramløv & Kristensen 1985)

Terra typica: Hungary (Europe)

Morocco:

- 33°04'N, 05°00'W; 2,000 m asl [2,100 m asl]: Meknès-Tafilalet Region, near Aguelmane de Si-Ali (Col du Zad) [Aguelmame Sidi Ali Lake], grass and humus soil on the lake shore. **Ramløv & Kristensen (1985)**
- 32°25'N, 05°13'W; 1,750 m asl: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on limestone boulders in the forest glade. **Ramløv & Kristensen (1985)**

Record numbers. Morocco: 1; **total: 1.**

Remarks. Mainly Palaearctic (McInnes 1994), with a few records from South and North America (McInnes 1994, Claps & Rossi 1997, Kaczmarek et al. 2015, 2016).

108. *Isohypsibius prosostomus* Thulin, 1928 [T]

Hypsibius (I.) prosostomus (Thulin, 1928) (Haspelslagh 1982)

I. prosostomus (Ramløv & Kristensen 1985)

Isohypsibius prosostomus (Thulin, 1928) (Séméria 1986)

Isohypsibius prosostomus Thulin 1928 (Binda et al. 2001)

Terra typica: Sweden (Europe)

Democratic Republic of Congo:

- 00°04'S, 29°18'E; 1,950 m asl: North Kivu Province, outskirts of Lukanga, lichen. **Binda et al. (2001)**

Kenya:

- 00°09'S, 37°19'E; **4,439 m asl**: Meru County, Mount Kenya National Park, Mount Kenya, Upper Kami Tarn, shore, sediments. **Haspelslagh (1982)**
- 00°09'S, 37°19'E; **4,439 m asl**: Meru County, Mount Kenya National Park, Mount Kenya, Lower Kami Tarn, shore, sediments. **Haspelslagh (1982)**
- 00°10'S, 37°18'E; **4,270 m asl**: Nyeri County, Mount Kenya National Park, Mount Kenya, Teleki Tarn, small effluent and shallow pond, silt, sediments and sandy gravel. **Haspelslagh (1982)**

Morocco:

- 33°31'N, 05°07'W; **1,650 m asl**: Meknès-Tafilalet Region, Ras al Ma [Res el Ma], mosses trees (*Cedrus*) and rocks. **Séméria (1986)**
- 32°25'N, 05°13'W; **1,750 m asl**: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on basalt boulders in the forest glade. **Ramløv & Kristensen (1985)**
- 31°06'N, 07°55'W; **2,300–2,500 m asl**: Tadla-Azilal Region, path to the Jebel Toubkal, scattered tussock vegetation, moss on basalt and mica slate. **Ramløv & Kristensen (1985)**

Record numbers. Democratic Republic of Congo: 1, Kenya: 3, Morocco: 3; **total 7.**

Remarks. This species is largely Palaearctic with limited reports from other regions (McInnes 1994), indicative of a probable species complex. The original description for *I. prosostomus* requires a re-evaluation of the type material to clarify the confused descriptions. For example, Haspelslagh (1982) corroborates Cuenot (1932) noting a “characteristic oblique cuticular bar” at the base of claws I–III, which was absent in the original description (Thulin 1911, 1928).

109. *Isohypsibius pseudundulatus* (da Cunha & do Nascimento Ribeiro, 1964) [T]

Hypsibius pseudundulatus sp. n. (da Cunha & do Nascimento Ribeiro 1964)

Terra typica: Angola (Africa)

Angola:

- 07°47'S, 15°01'E; 650 m asl: **Type Locality:** Uíge Province, near Carmona [Uíge], Estate at Pumba Loge, mosses. **da Cunha & do Nascimento (1964)**

Record numbers. Angola: 1; **total: 1.**

Remarks. This species has not been reported outside the original type locale in Angola.

110. *Isohypsibius ronsisvallei* Binda & Pilato, 1969b [T]

I. ronsisvallei (Ramløv & Kristensen 1985)

Terra typica: Italy (Europe)

Morocco:

- 32°25'N, 05°13'W; **1,750 m asl**: Meknès-Tafilalet Region, S of Azrou, cedar forest, cedar forest, moss on soil and fallen branches and stems. **Ramløv & Kristensen (1985)**

Record numbers. Morocco: 1; **total: 1.**

Remarks. A rarely reported species but with a largely Palaearctic distribution (McInnes 1994).

111. *Isohypsibius sattleri* (Richters, 1902) *sensu lato* [T]

Hypsibius sattleri (Richters) 1902 (da Cunha & do Nascimento 1964)

Isohypsibius bakonyiensis (Iharos, 1964) (Binda 1971, 1984)

Isohypsibius bakonyiensis Iharos, 1964 (Pilato & Pennisi 1976)

Hypsibius bakonyiensis Iharos (Iharos 1978)

Isohypsibius bakonyiensis, *I. sattleri* (Ramløv & Kristensen 1985)

Isohypsibius sattleri (Richters, 1902) (Pilato et al. 2003)

Terra typica: Germany (Europe)

Angola:

- 07°47'S, 15°01'E; 650 m asl: Uíge Province, near Carmona [Uíge], Estate at Pumba Loge, mosses. **da Cunha & do Nascimento (1964)**

Democratic Republic of Congo:

- 00°04'S, 29°18'E; 1,950 m asl: North Kivu Province, outskirts of Lukanga, moss (*Brachythecium velutinum*). **Pilato et al. (2003)**

Libya:

- 32°29'N, 20°50'E; 350 m asl: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Morocco:

- 32°56'N, 05°40'W; **1,700 m asl** [850 m asl]: Meknès-Tafilalet Region, Khénifra, moss. **Binda (1971)**
- 32°25'N, 05°13'W; **1,750 m asl**: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on basalt and limestone boulders

in the forest glade and moss on soil and fallen branches and stems (3 samples). **Ramløv & Kristensen (1985)**

- Republic of South Africa:
- $34^{\circ}01'S$, $23^{\circ}55'E$; 200 m asl: Eastern Cape Province, Tzitzikama [Tsitsikamma National Park], moss. **Binda (1984)**

Tunisia:

- $36^{\circ}14'N$, $08^{\circ}46'E$; **1,100 m asl**: Kef Governorate, Kef Governorate, 6 km NE of El Kef, Djebel Eddir Mts., surroundings of Ferme Shitta, moss and lichen on rock. **Iharos (1978)**
- $36^{\circ}46'36''N$, $08^{\circ}42'45''E$; **784 m asl**: Jendouba Governorate, Beni M'tir, urban, moss on soil. **Çaşıorek et al. (2017)**

Record numbers. Angola: 1, Democratic Republic of Congo: 1, Libya: 1, Morocco: 2, Republic of South Africa: 1, Tunisia: 2; **total: 8.**

Remarks. This member of the *tuberculatus*-group has a history of major taxonomic confusion with *I. bakonyiensis* (now the junior synonym), but was re-described from a Richters' 1905 slide in the Senckenberg Museum (Germany) by Dastych (1990). Nevertheless, the literature-based, supposed, cosmopolitan distribution (McInnes 1994), requires major taxonomic re-evaluation of all specimens attributed to *I. sattleri*.

112. *Isohypsibius schaudinni* (Richters, 1909) sensu lato [T]

H. (I.) schaudinni (Richters) 1901 (Marcus 1936)

Hypsibius schaudinni (Iharos 1969a)

Terra typica: Svalbard (Spitsbergen)

Gabon:

- $00^{\circ}18'N$, $09^{\circ}30'E$; **10–40 m asl**: Estuaire Province, near Libreville, Owendo, moss on tree. **Iharos (1969a)**

Kenya:

- $01^{\circ}05'S$, $37^{\circ}15'E$; 1,400 m asl: Kiambu County, between Nairobi and Fort Hall, Thika Falls [Fourteen Falls] on Athi River, on spray wet leaves at the foot of the waterfall. **Marcus (1935)**

Zimbabwe:

- $20^{\circ}06'S$, $31^{\circ}00'E$; 1,050 m asl: Masvingo Province, Popoteke Gorge [Popoteki Gorge], along the river, under reeds, humid soil. **Van Rompu et al. (1995)**

Record numbers. Gabon: 1, Kenya: 1, Zimbabwe: 1; **total: 3.**

Remarks. The largely Holarctic distribution (McInnes 1994), requires taxonomic revision of type material to clarify the true distribution of this species.

113. *Isohypsibius tuberculatus* (Plate, 1888) sensu lato [T]

M. tuberculatus Plate (Murray 1913)

I. tuberculatus (Ramløv & Kristensen 1985)

Terra typica: Germany (Europe)

Kenya:

- $00^{\circ}01'S$, $37^{\circ}54'E$: Undefined locality, British East Africa [Kenya], moss. **Murray (1913)**

Morocco:

- $32^{\circ}25'N$, $05^{\circ}13'W$; **1,750 m asl**: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on limestone boulders in the forest glade. **Ramløv & Kristensen (1985)**

Record numbers. Kenya: 1, Morocco: 1; **total: 2.**

Remarks. Like many early descriptions, the original information about *I. tuberculatus* was limited and has created the *tuberculatus*-group of species, with a long history of major taxonomic confusion. This nominal species is largely Holarctic (McInnes 1994), but all reports, including the African records, require further analyses.

Genus: *Paradiphascon* Dastych, 1992

114. *Paradiphascon manningi* Dastych, 1992 [T]

Paradiphascon manningi sp. nov. (Dastych 1992)

Terra typica: Republic of South Africa: (Africa)

Republic of South Africa:

- $33^{\circ}34'S$, $19^{\circ}7'E$ [$33^{\circ}34'S$, $19^{\circ}07'E$]; **600 m asl**: Cape [Western Cape] Province, District of Wellington, Beine's Kloof Pass, Fynbos plant association, mosses and sandstone-derived soil. **Dastych (1992)**

Record numbers. Republic of South Africa: 1; **total: 1.**

Remarks. Has not been recorded outside the type locale, Republic of South Africa.

Genus: *Parhexapodibius* Pilato, 1969

115. *Parhexapodibius lagrecai* (Binda & Pilato, 1969a) [T]

Terra typica: Italy (Europe)

Algeria:

- 36°28'N, 04°14'E; 1,700 m asl: Tizi Ouzou Province, Massif of Djurdjura (Assouille depression). **Binda & Pilato (1987)**

Record numbers. Algeria: 1; **total: 1.**

Remarks. Only reported from Sicily (Italy) and Algeria (McInnes 1994).

Genus: *Pseudobiotus* Nelson, 1980

116. *Pseudobiotus megalonyx* (Thulin, 1928) [T]

Hypsibius (Isohypsibius) megalonyx (Thul.) (Marcus 1933)

Terra typica: Sweden (Europe)

Algeria:

- 32°46'N, 00°25'W; 1,000 m asl: Naâma Province, Aïn Sefra, Reservoir of Tiout Oasis, dry *Bryum* turf. **Marcus (1933)**

Record numbers. Algeria: 1; **total: 1.**

Remarks. This report for *Isohypsibius megalonyx* compares details with *Hypsibius (Isohypsibius) augusti* (Murray 1907), but, with the historical confusion between these species, the records from North Africa should be considered questionable.

117. *Pseudobiotus* sp. [F]

Hypsibius (Isohypsibius) Augusti J. Murray (Marcus 1935)

Hypsibius augusti Murray (Löfflera 1968)

Hypsibius (Isohypsibius) augusti (Murray, 1907) (Haspeslagh 1982)

Pseudobiotus augusti (Ramløv & Kristensen 1985)

Isohypsibius augusti (Murray, 1907) (De Smet & Bafort 1990)

Terra typica: Sweden (Europe)

Kenya:

- 00°03'N, 35°32'E; 3,000 m asl [2,750 m asl]: Uasin Gishu County, Elgeyo Escarpment, Timboroa, Station 10, source below the Narasha Lake. **Marcus (1935)**
- 00°03'S, 37°34'E; 2,140 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Marimba River, rushes. **De Smet & Bafort (1990)**
- 00°09'S, 37°18'E; 4,350 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Hausberg Creek. **Löfflera (1968)**
- 00°09'S, 37°19'E; 4,400 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Lower Simba Tarn. **Löfflera (1968)**
- 00°09'S, 37°21'E; 4,300 m asl: Meru County, Mount Kenya National Park, Mount Kenya, West Hall Tarn. **Löffler (1968)**
- 00°10'S, 37°17'E; 4,150 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Teleki River, moss. **De Smet & Bafort (1990)**
- 00°10'S, 37°18'E; 4,270 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Teleki Tarn, small effluent and shallow pond, silt, sediments and sandy gravel. **Haspeslagh (1982)**
- 00°10'S, 37°19'E; 4,300 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Upper Thompson Tarn. **Löfflera (1968)**
- 00°11'S, 37°21'E; 3,950 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Lower Carr Lake. **Löfflera (1968)**

Morocco:

- 31°35'N, 05°36'W; 1,650 m asl: Souss-Massa-Drâa Region, Todra [Todgha] Gorge, moss from running water (source at the hotel). **Ramløv & Kristensen (1985)**
- 30°41'N, 08°09'W; 750 m asl: Souss-Massa-Drâa Region, Sous river at Aoulouz, sludge and algae in river. **Ramløv & Kristensen (1985)**

Record numbers. Kenya: 9, Morocco: 2; **total: 11.**

Remarks. Reports for *Isohypsibius augusti* are included here as there has been major taxonomic confusion between the original description as *Macrobotus augusti* (Murray 1907), which was transferred to *Isohypsibius* by Thulin (1928) and a re-description from non-type material by Marcus (1936), leaving all *augusti* records split between *Pseudobiotus* and *Thulinus* (see: Bertolani *et al.* 1999, Marley *et al.* 2008). While Murray's (1907e) *augusti* is now *Thulinus*, the Kenyan references are associated with *megalonyx* (Marcus 1935) (now

Pseudobiotus), or have either no description or no figures (Haspeslagh 1982, De Smet & Bafort 1990). The Moroccan report only indicated a *Pseudobiotus* sp. (Ramløv & Kristensen 1985). Re-examination of all the African samples is required to confirm which taxa are present.

Genus: *Thulinus* Bertolani, 2003

118. *Thulinus ruffoi* Bertolani, 1981 [F]

Terra typica: Italy (Europe)

Uganda:

- 00°18.385'N, 29°53.080'E; 4,250 m asl: Western Region, Kasese District, Rwenzori Mountains National Park, Zaphania's Pool, *Carex-Sphagnum* fens. Kaczmarek *et al.* (2008)

Record numbers. Uganda: 1; **total: 1.**

Remarks. A Holarctic distribution suggests this Ugandan reference may require re-examination.

Macrobioidea Thulin, 1928 in Marley *et al.* 2011

Family: Macrobiotidae Thulin, 1928

Subgenus: *Calcarobiotus* (*Calcarobiotus*) Dastych, 1993

119. *Calcarobiotus* (*Calcarobiotus*) *filmeri* Dastych, 1993 [T]

Calcarobiotus filmeri sp. n. (Dastych 1993)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- 25°02'S, 30°36'E; 2,000 m asl: **Type Locality**: Mpumalanga Province, Waterriver Valley [waterfall river valley], between Lydenburg and Bergersdorp [Burgersfort], soil, detritus and tiny roots. Dastych (1993)

Record numbers. Republic of South Africa: 1; **total: 1.**

Remarks. This species has since been reported from Thailand (Tumanov 2005).

120. *Calcarobiotus* (*Calcarobiotus*) *occultus* Dastych, 1993 [T]

Calcarobiotus occultus sp. n. (Dastych 1993)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- 25°44'S, 28°17'E; 1,350 m asl: Gauteng Province, Pretoria, Botanical Garden [Pretoria National Botanical Garden], moss on stone. Dastych (1993)
- 28°56'S, 29°09'E; 1,920 m asl: **Type Locality**: KwaZulu-Natal Province, Central Drakensberg [Drakensberg Mountains], Cathedral Peak area, meadow near artificially planted pine forest, soil between grass-tussocks. Dastych (1993)
- 28°58'S, 29°11'E; 1,940 m asl: KwaZulu-Natal Province, Central Drakensberg [Drakensberg Mountains], Cathedral Peak area, Tarn Hills, moss on rocks (basalt). Dastych (1993)
- 29°26'S, 29°31'E; 1,660 m asl: KwaZulu-Natal Province, Central Drakensberg [Drakensberg Mountains], Cathedral Peak area, near Ukhahlamba ('Museum's House') [Ukhahlamba Drakensberg World Heritage Site], moss on rocks. Dastych (1993)

Record numbers. Republic of South Africa: 4; **total: 4.**

Remarks. Outside the type locale, Republic of South Africa, a single specimen is recorded from Micronesia (Van Rompu *et al.* 1996).

121. *Calcarobiotus* (*Calcarobiotus*) *parvicar* Pilato & Lisi, 2009 [T]

Terra typica: Seychelles (Indian Ocean)

Republic of Zambia:

- 17°55'S, 25°52'E; 890 m asl: Southern Province, near Livingstone, in the Victoria Falls gorge, mosses and leaf litter on soil. Zawierucha *et al.* (2012)

Record numbers. Republic of Zambia: 1; **total: 1.**

Remarks. This species has only been reported from Seychelles (type locality) and Republic of Zambia.

Subgenus: *Calcarobiotus (Discrepunguis)* Guidetti & Bertolani, 2001b

122. *Calcarobiotus (Discrepunguis) polygonatus* (Binda & Guglielmino, 1991) [T]

Macrobiotus polygonatus n. sp. (Binda & Guglielmino 1991)

Terra typica: Tanzania (Africa)

Tanzania:

- $03^{\circ}12'S$, $37^{\circ}31'E$; **2,200–2,400 m asl:** **Type Locality:** Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, moss and lichen. **Binda & Guglielmino (1991)**

Record numbers. Tanzania: 1; **total 1.**

Remarks. Only recorded from continental Africa and Madagascar (Maucci 1993).

Genus: *Macrobiotus* C.A.S. Schultz, 1833

123. *Macrobiotus drakensbergi* Dastych, 1993 [T]

Macrobiotus drakensbergi sp. n. (Dastych 1993)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- $28^{\circ}58'S$, $29^{\circ}11'E$; **1,940 m asl:** **Type Locality:** KwaZulu-Natal Province, Central Drakensberg [Drakensberg Mountains], Cathedral Peak area, Tarn Hills, moss on rocks (basalt). **Dastych (1993)**
- $29^{\circ}26'S$, $29^{\circ}31'E$; **1,660 m asl:** KwaZulu-Natal Province, Central Drakensberg [Drakensberg Mountains], Cathedral Peak area, near Ukhahlamba ('Museum's House') [Ukhahlamba Drakensberg World Heritage Site], moss on rocks. **Dastych (1993)**

Record numbers. Republic of South Africa: 2; **total: 2.**

Remarks. This species is currently endemic to the Republic of South Africa.

124. *Macrobiotus echinogenitus* Richters, 1904f *sensu lato* [T]

Macrobiotus echinogenitus (Teunissen 1938)

Macrobiotus echinogenitus Richters, 1904 (Pilato & Pennisi 1976, Binda & Pilato 1987, Binda 1988)

Macrobiotus cf. *echinogenitus* Richters, 1904 (Meyer & Hinton 2009)

Terra typica: Svalbard (Spitsbergen)

Algeria:

- $36^{\circ}49'N$, $05^{\circ}47'E$; **0 m asl:** Jijel Province, Jijel, Les Aftis beach (Ziama Monsouria). **Binda & Pilato (1987), Binda (1988)**
- Democratic Republic of Congo:
- $01^{\circ}25'S$, $29^{\circ}27'E$: Undefined locality, North Kivu Province, Albert National Park [Virunga National Park], soil. **Teunissen (1938)**

Israel and Palestinian National Authority:

- $31^{\circ}46'N$, $35^{\circ}16'E$; **650 m asl:** Judean Mountains, al-Eizariya, Bethany, Tomb of Lazarus, semi-arid climate, moss (*Orthotrichum* sp.) on rock. **Rahm (1936)**

Libya:

- $32^{\circ}29'N$, $20^{\circ}50'E$; **350 m asl:** Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Morocco:

- $32^{\circ}56'N$, $05^{\circ}40'W$; **1,700 m asl** [850 m asl]: Meknès-Tafilalet Region, Khenifra [Khénifra], moss. **Binda (1988)**

Republic of South Africa:

- $29^{\circ}44'S$, $22^{\circ}44'E$: Undefined locality, Cape Colony [Cape Province]. **Murray (1907a)**
- $29^{\circ}48'S$, $29^{\circ}30'E$; **1,550 m asl:** KwaZulu-Natal Province, Underberg, moss on soil. **Meyer & Hinton (2009)**

Record numbers. Algeria: 1, Democratic Republic of Congo: 1, Israel and Palestinian National Authority 1, Libya: 1, Morocco: 1, Republic of South Africa: 2; **total: 7.**

Remarks. The short note describing *Macrobiotus echinogenitus* (Richters 1904f) was followed by a more detailed description (Richters 1904b) but raised issues, discussed in Marcus (1936), leading to this species being synonymised with *Macrobiotus harmsworthi* and *M. areolatus*. The out-dated original descriptions have produced a cosmopolitan (McInnes 1994) species group. As this nominal species requires a formal taxonomic re-description, all African record need re-examination using integrated taxonomy.

125. *Macrobiotus hibiscus* de Barros, 1942 *sensu lato* [T]

Macrobiotus hibiscus Barros, 1942 (Grigarick *et al.* 1973)

Terra typica: Brazil (South America)

Tanzania:

- 06°22'S, 34°53'E: Undefined locality. **Grigarick et al. (1973)**

Record numbers. Tanzania: 1; **total: 1.**

Remarks. This reference is based solely on eggs, with no additional information. *Macrobotus hibiscus* is possibly a junior synonym of *Macrobotus hufelandi* as the morphology of this species falls within the *Macrobotus hufelandi* group diagnosis (e.g. Kathman 1990). This group requires careful taxonomic analysis, including egg morphology, for correct identification (see Bertolani & Rebecchi 1993 for a diagnostic key and other papers for more recent species descriptions: e.g. Pilato et al. 2003b, Kaczmarek & Michalczyk 2004c, Fontoura et al. 2008b, Bartels et al. 2009, Kaczmarek & Michalczyk 2009b, Guidetti et al. 2013). A few additional species from the *hufelandi* group have been described from Africa and neighbouring islands, e.g. *M. iharosi* or *M. madegassus* Maucci, 1993. Further work on the Brazilian type material or type locale will clarify the status and biogeography of this species. The limited material from this report suggests the presence of *M. hibiscus* in Africa is very doubtful.

126. *Macrobotus hufelandi* C.A.S. Schultze, 1833 sensu lato [T]

M. hufelandii (Richters) (Murray (1907a)

Macrobotus hufelandii Sch. (Murray 1913)

Macrobotus hufelandi C.A.S. Schultze 1834 (Rahm 1936, Teunissen 1938)

Macrobotus hufelandi S. Schultze. (Pardi 1941)

Macrobotus hufelandii C.A.S. Schultze 1833 (Rodriguez-Roda 1947)

Macrobotus hufelandi C.A. Schultze 1834 (da Cunha & do Nascimento 1964)

Macrobotus hufelandii (Iharos 1969a)

Macrobotus hufelandi Schultze, 1833 (Binda 1971, Pilato & Pennisi 1976, Binda & Pilato 1987, De Smet & Bafort 1990)

Macrobotus hufelandi Schultze type eggs (Toftner et al. 1975)

Macrobotus hufelandii Schultze (Iharos 1978)

Macrobotus hufelandii Schultze, 1833 (Haspeslagh 1982)

M. hufelandii (Ramløv & Kristensen 1985)

Macrobotus hufelandi Schultze, 1833 (Séméria 1986)

Macrobotus cf. *hufelandi* Schultze, 1833 (Middleton 2003)

Terra typica: Germany (Europe)

Algeria:

- 36°49'N, 05°47'E; 0 m asl: Jijel Province, Jijel, Les Aftis beach (Ziama Monsouria). **Binda & Pilato (1987)**
- 36°40'N, 04°36'E; 1,400 m asl: Tizi Ouzou Province, Akfadou Forest. **Binda & Pilato (1987)**
- 36°38'N, 05°45'E; 1,200 m asl: Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**
- 36°28'N, 04°14'E; 1,700 m asl: Tizi Ouzou Province, Massif of Djurdjura (Assouille depression). **Binda & Pilato (1987)**
- 34°40'N, 06°11'E; 0 m asl: Biskra Province, 30 km from Biskra, El Oued [Zeribet el Oued]. **Binda & Pilato (1987)**

Angola:

- 07°47'S, 15°01'E; 650 m asl: Uíge Province, near Carmona [Uíge], Estate at Pumba Loge, mosses and lichens. **da Cunha & do Nascimento (1964)**
- 14°55'S, 13°30'E; 1,750 m: Huíla Province, surroundings of Sá da Bandeira [Lubango], mosses and lichens. **da Cunha & do Nascimento (1964)**

Botswana:

- 19°10'S, 23°25'E; 950 m asl: North West District, Moremi, moss or lichen on tree or rock. **Middleton (2003)**

Cameroon:

- 04°57'N, 09°56'E; 800 m asl: Littoral Region, Kongsamba [Nkongsamba], moss on tree. **Iharos (1969a)**
- 04°13'N, 09°10'E; 4,000 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, moss on lava and near fumaroles (80°C), moss on soil (2 samples). **Iharos (1969a)**
- 04°12'N, 09°12'E; 2,900–3,000 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, moss on tree and lava. **Iharos (1969a)**
- 04°11'N, 09°12'E; 1,900–1,950 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, primeval forest, above bothy No. 1, moss on trees and lava. **Iharos (1969a)**
- 04°11'N, 09°12'E; 1,950–2,050 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, S side, grassy lava field and the area of the timberline by trees and lava. **Iharos (1969a)**
- 04°10'N, 09°13'E; 1,300–1,500 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, rainforest, moss on tree. **Iharos (1969a)**
- 04°10'N, 09°13'E; 1,660–1,800 m asl: Southwest Region, Mount Cameroon National Park, Mount Cameroon, rainforest, moss on tree. **Iharos (1969a)**

Democratic Republic of Congo:

- 01°24'S, 29°15'E; 2,075 m asl: North Kivu Province, Albert National Park [Virunga National Park], Mushumangabo,

Eastern slope of the volcano Nyamuragira, soil. **Teunissen (1938)**

Equatorial Guinea:

- *03°36'N, 08°46'E; 2,500 m asl*: Fernando Póo [Bioko Island], Bioko Norte Province, Pico Basilé, mosses and liverworts between *Lycopodium* sp. **Rodriguez-Roda (1947)**
- *03°36'N, 08°46'E; 2,500 m asl*: Fernando Póo [Bioko Island], Bioko Norte Province, Pico Basilé, forest edge, lichen on trunk *Agauria salicifolia* (Ericaceae). **Rodriguez-Roda (1947)**
- *03°35'N, 08°46'E; 3,000 m asl*: Fernando Póo [Bioko Island], Bioko Norte Province, Pico Basilé, mosses on *Blaeria mani* [synonym of *Erica silvatica* (Engl.) Beentje] (Ericaceae), and four samples of liverworts and mosses (5 samples). **Rodriguez-Roda (1947)**
- *03°25'N, 08°34'E*: Fernando Póo [Bioko Island], Bioko Sur Province, Balechá [nr. Bocoricho Ombori], mosses. **Rodriguez-Roda (1947)**
- *03°25'N, 08°39'E; 600 m asl*: Fernando Póo [Bioko Island], Bioko Sur Province, Musola [Parador de Musola], mosses on *Ficus* sp. **Rodriguez-Roda (1947)**

Ethiopia:

- *04°03'N, 38°19'E; 1,700 m asl*: Oromia Region, Mēga, moss (*Neckera* sp.) on tree (*Juniperus procera*) and former English residence, moss on tree (*Juniperus procera*) **Pardi (1941)**

Israel and Palestinian National Authority:

- *32°52'N, 35°33'E; -200 m asl*: NW shore of Sea of Galilee, Tabgha, extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *32°48'N, 35°32'E; -100 m asl*: W shore of Sea of Galilee (Lake Tiberias), Tiberias, extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *32°46'N, 35°01'E; 450 m asl*: Haifa, Carmel Mt., extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *32°42'N, 35°18'E; 350 m asl*: Judean Mountains, Nazareth, extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *31°51'N, 35°25'E; -100 m asl*: near Jericho, St. George's Monastery, Wadi Qelt, extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *31°48'N, 35°06'E; 700 m asl*: Judean Mountains, Kiriath-Jearim [Kariathiarim], extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *31°48'N, 35°06'E; 700 m asl*: Judean Mountains, Kiriath-Jearim [Kariathanavim], extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *31°48'N, 35°13'E; 800 m asl*: Judean Mountains, Jerusalem, Tombs of the Sanhedrin [Tombs of the Judges], extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *31°47'N, 35°14'E; 750 m asl*: Judean Mountains, Jerusalem, temples walls, extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *31°47'N, 35°15'E; 800 m asl*: Judean Mountains, Jerusalem, Olives Mt., Pater Noster church, Russians tower, wall of church, extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *31°46'N, 35°14'E; 650 m asl*: Judean Mountains, Jerusalem, Aceldama, rock, extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *31°41'N, 35°10'E; 800 m asl*: Judean Mountains, Solomon's Pools, extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**
- *31°46'N, 35°34'E; -400 m asl*: mouth of the Jordan River to Dead Sea, extreme arid, semi-arid or semi-humid climate, moss. **Rahm (1936)**

Kenya:

- *00°01'S, 37°05'E; 1,950 m asl*: Nyeri County, Mount Kenya National Park, Mount Kenya, Nanyuki River, vascular plants. **De Smet & Bafort (1990)**
- *00°01'S, 37°54'E*: Undefined locality, British East Africa [Kenya], moss. **Murray (1913)**
- *00°10'S, 37°18'E; 4,270 m asl*: Nyeri County, Mount Kenya National Park, Mount Kenya, Teleki Tarn, small effluent and shallow pond, silt, sediments and sandy gravel. **Haspeslagh (1982)**

Lesotho:

- *29°19'S, 27°29'E; 1,550 m asl*: Maseru District, Maseru, moss or lichen on tree or rock. **Middleton (2003)**
- *29°38'S, 27°31'E; 1,750 m asl*: Maseru District, Morija, moss or lichen on tree or rock. **Middleton (2003)**
- Libya:
- *32°29'N, 20°50'E; 350 m asl*: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Morocco:

- *33°31'N, 05°07'W; 1,650 m asl*: Meknès-Tafilalet Region, Ras al Ma [Res el Ma], mosses on trees (*Cedrus*) and rocks. **Séméria (1986)**
- *33°04'N, 05°00'W; 2,000 m asl [2,100 m asl]*: Meknès-Tafilalet Region, near Aguelmane de Si-Ali (Col du Zad) [Aguelmame Sidi Ali lake], scattered basalt blocks (lava field) lying on the shores of the lake, mosses on basalt blocks, mosses on basalt blocks. **Ramløv & Kristensen (1985)**
- *32°56'N, 05°40'W; 1,700 m asl [850 m asl]*: Meknès-Tafilalet Region, Khénifra, moss. **Binda (1971)**
- *32°25'N, 05°13'W; 1,750 m asl*: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on limestone boulders in the

forest glade. **Ramløv & Kristensen (1985)**

- $31^{\circ}06'N$, $07^{\circ}55'W$; **2,300–2,500 m asl**: Tadmra-Azilal Region, path to the Jebel Toubkal, scattered tussock vegetation, moss on basalt and mica slate. **Ramløv & Kristensen (1985)**
- $30^{\circ}43'N$, $08^{\circ}12'W$; **700 m asl**: Souss-Massa-Drâa Region, camp 10 km W of Aoulouz, arid area, scattered *Argania*-vegetation with sparse undergrowth of grass, moss on damp soil. **Ramløv & Kristensen (1985)**

Republic of South Africa:

- $23^{\circ}50'S$, $29^{\circ}59'E$; **1,450 m asl**: N Transvaal [Limpopo Province], Woodbush [Woodbush Forest Reserve]. **Murray (1913)**
- $26^{\circ}52'S$, $32^{\circ}15'E$; **50 m asl**: Natal [KwaZulu-Natal Province], Ndumo [Ndumo Game Reserve]. **Toftner et al. (1975)**
- $29^{\circ}44'S$, $22^{\circ}44'E$: Undefined locality, Cape Colony [Cape Province]. **Murray (1907a)**

Rwanda:

- $01^{\circ}32'S$, $29^{\circ}27'E$; **2,400 m asl**: Western Province, Albert National Park [Volcanoes National Park], Ilega, S side of Karisimbi volcano and NE of Lake N'Gondo, clearing with pools in a forest of bamboos (*Hypericum* and *Hagenia*), soil. **Teunissen (1938)**

Tanzania:

- $03^{\circ}14'S$, $36^{\circ}46'E$; **3,650 m asl**: Arusha Region, Meru Mountain. **Toftner et al. (1975)**

Tunisia:

- $36^{\circ}46'N$, $08^{\circ}41'E$; **700 m asl**: Jendouba Governorate, surroundings of Ain Draham, moss on rock and moss and lichen on tree (*Quercus sauber*) (2 samples). **Iharos (1978)**
- $36^{\circ}14'N$, $08^{\circ}46'E$; **1,100 m asl**: Kef Governorate, 6 km NE of El Kef, Kef Governorate, 6 km NE of El Kef, Djebel Eddir Mts., surroundings of Ferme Shitta, moss and lichen on rock. **Iharos (1978)**
- $36^{\circ}08'N$, $08^{\circ}27'E$; **400 m asl**: Kef Governorate, along road from El Kef and Sakiet, below trees (*Pinus halepensis* and *Juniperus phoenicis*), mixed moss and lichen sample. **Iharos (1978)**
- $36^{\circ}07'N$, $08^{\circ}32'E$; **450 m asl**: Kef Governorate, along road from El Kef and Sakiet, 21 km W El Kef, strongly insolated area, lichen on soil. **Iharos (1978)**
- $35^{\circ}52'N$, $09^{\circ}10'E$; **850 m asl**: Siliana Governorate, surroundings of Maktar, 2 km NW of the town, soil sample from base of *Pinus pinsapo* mixed with roots. **Iharos (1978)**

Uganda:

- $01^{\circ}22'N$, $32^{\circ}17'E$: Undefined locality. **Murray (1913)**

Record numbers. Algeria: 5, Angola: 2, Botswana: 1, Cameroon: 7, Democratic Republic of Congo: 1, Equatorial Guinea: 5, Ethiopia: 2, Israel and Palestinian National Authority: 13, Kenya: 3, Lesotho: 2, Libya: 1, Morocco: 6, Republic of South Africa: 3, Rwanda: 1, Tanzania: 1, Tunisia: 5, Uganda: 1; **total: 59.**

Remarks. Taxa identified as *Macrobotus hufelandi sensu lato* have a cosmopolitan distribution (McInnes 1994). However, this nominal species and all other *hufelandi* group taxa require careful taxonomic analysis, including egg morphology, in order to properly differentiate the individual species (see Bertolani & Rebecchi 1993 for the review and for e.g. Pilato et al. 2003b, Kaczmarek & Michalczyk 2004c, Fontoura et al. 2008b, Bartels et al. 2009, Kaczmarek & Michalczyk 2009b, Guidetti et al. 2013 for new species within the group). These, particularly older, African reports citing the presence of *M. hufelandi*, need re-assessment using modern integrated taxonomy.

127. *Macrobotus humilis* Binda & Pilato, 2001 sensu lato [T]

Macrobotus cf. humilis Binda and Pilato, 2001? (Gąsiorek et al. 2017)

Terra typica: Sri Lanka (Asia)

Tunisia:

- $36^{\circ}43'33''N$, $08^{\circ}44'04''E$; **362 m asl**: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- $36^{\circ}43'20''N$, $08^{\circ}40'58''E$; **668 m asl**: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- $36^{\circ}43'19''N$, $08^{\circ}43'30''E$; **474 m asl**: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**

Record numbers. Tunisia: 3; **total: 3.**

Remarks. Like other members of the *hufelandi* group, this species requires careful taxonomic analysis, including egg morphology, to properly differentiate the individual species (see Bertolani & Rebecchi 1993 for the review). This recently described species is recorded from the type locality and this tentative report (marked as cf.) from Tunisia (Gąsiorek et al. 2017).

128. *Macrobotus iharosi* Pilato, Binda & Catanzaro, 1991 [T]

Macrobotus iharosi n. sp. (Pilato et al. 1991)

Macrobotus iharosi Pilato, Binda & Catanzaro 1991 (Binda & Pilato 1995a, Pilato et al. 2003)

Terra typica: Tanzania (Africa)

Democratic Republic of Congo:

- $00^{\circ}04'S$, $29^{\circ}18'E$; **1,950 m asl**: North Kivu Province, outskirts of Lukanga, lichen (1 sample) and moss (*Brachythecium*)

velutinum) (1 sample). **Pilato et al. (2003)**

- $01^{\circ}10'S$, $28^{\circ}28'E$; $1,000\text{ m asl}$: North Kivu Province, outskirts of Mohanga, moss (*Campylopus* cfr. *fragilis*). **Pilato et al. (2003)**

Republic of South Africa:

- $29^{\circ}44'S$, $30^{\circ}32'E$; 750 m asl : KwaZulu-Natal Province, Tala Private Game Reserve, lichen on tree (*Acacia*). **Meyer & Hinton (2009)**

Tanzania:

- $03^{\circ}09'S$, $35^{\circ}29'E$: **Type Locality:** Undefined locality, Arusha Region, Ngorongoro Volcano, mosses. **Pilato et al. (1991)**
- $03^{\circ}12'S$, $37^{\circ}31'E$; **2,200–2,400 m asl:** Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1995a)**

Record numbers. Democratic Republic of Congo: 2, Republic of South Africa: 1, Tanzania: 2; **total: 5.**

Remarks. Like other members of the *hufelandi* group, this species requires careful taxonomic analysis, including egg morphology, to properly differentiate the individual species (see Bertolani & Rebecchi 1993 for the review). This recently described species is currently reported from central and southern Africa.

129. *Macrobotus islandicus* Richters, 1904e sensu lato [T]

Terra typica: Iceland (Europe)

Algeria:

- $34^{\circ}40'N$, $06^{\circ}11'E$; 0 m asl : Biskra Province, 30 km from Biskra, El Oued [Zeribet el Oued]. **Binda & Pilato (1987)**

Record numbers. Algeria: 1; **total: 1.**

Remarks. This nominal species of the *M. islandicus* group has a Holarctic distribution (McInnes 1994). While the presence of this taxon in Africa is possible, Binda & Pilato (1987) found only a single egg (with no adults), which they attributed to *M. islandicus*. To confirm the presence of *M. islandicus* further study producing more specimens is required.

130. *Macrobotus kurasi* Dastych, 1981 [T]

Macrobotus kurasi sp. nov. (Dastych, 1981)

Terra typica: Uganda (Africa)

Uganda:

- $01^{\circ}09'N$, $34^{\circ}31'E$; **ca. 4,100 m asl:** Eastern Region, Kween District, Mount Elgon summit, Point John, moss on effusive rock. **Dastych (1981)**
- $00^{\circ}22'N$, $29^{\circ}53'E$; **ca. 4,250 m asl: Type Locality:** Western Region, Kasese District, Ruwenzori Mountains, 100 m below Scott Elliot Pass, moss on tree. **Dastych (1981)**

Record numbers. Uganda: 2; **total: 2.**

Remarks. This species is has not been reported outside the type locale.

131. *Macrobotus naskreckii* Bąkowski, Roszkowska, Gawlak & Kaczmarek 2015 [T]

Macrobotus naskreckii sp. nov. (Bąkowski et al. 2015)

Terra typica: Mozambique (Africa)

Mozambique:

- $18^{\circ}35'55''S$, $34^{\circ}20'35''E$; **1,824 m asl:** Sofala Province, Bunga Inselberg, Gorongosa National Park; giant piles of volcanic rock covered with a very thin layer of topsoil and a dense carpet of woody vegetation, moss on volcanic rock. **Stec et al. (2016)**

Record numbers. Mozambique: 1; **total: 1.**

Remarks. This species of *hufelandi* group is currently endemic to the Mozambique.

132. *Macrobotus occidentalis* Murray, 1910 sensu lato [T]

Macrobotus occidentalis J. Murray 1910, *Macrobotus occidentalis* J. Murray 1910 *betschârensis* nov. var. (Rahm 1936)

Macrobotus occidentalis J. Murray 1910 (da Cunha & do Nascimento 1964)

Terra typica: British Columbia (Canada, North America)

Angola:

- $07^{\circ}47'S$, $15^{\circ}01'E$; 650 m asl : Uíge Province, near Carmona [Uíge], Estate at Pumba Loge, lichens. **da Cunha & do Nascimento (1964)**
- $15^{\circ}01'S$, $13^{\circ}22'E$; $1,950\text{ m asl}$: Huíla Province, Sá da Bandeira [Lubango], Boca da Humpata, lichens. **da Cunha & do Nascimento (1964)**

Israel and Palestinian National Authority:

- $31^{\circ}47'N$, $35^{\circ}15'E$; 800 m asl : Judean Mountains, Jerusalem, Olives Mt., Pater Noster church, Russians tower, wall of church, moss (*Syntrichium* sp.) or lichen (*Xanthoria parietina*). **Rahm (1936)**

- $31^{\circ}46'N$, $35^{\circ}13'E$; 800 m asl: Undefined locality, “Betschar bei Kilometer 22”, moss (*Syntrichium* sp.) or lichen (*Xanthoria parietina*). **Rahm (1936)**

Tanzania:

- $03^{\circ}12'S$, $37^{\circ}31'E$; ca. 2,500 m asl: Kilimanjaro Region, Kilimanjaro National Park, Maranda [Mandara] trail, tree line, benthos sample from river. **Van Rompu et al. (1991a)**

Record numbers. Angola: 2, Israel and Palestinian National Authority: 2, Tanzania: 1; **total: 5.**

Remarks. *Macrobotus occidentalis sensu lato* is largely Holarctic (McInnes 1994), with a few southern hemisphere reports. The possibility of a species complex would indicate these African specimens should be re-examined.

133. *Macrobotus paulinae* Stec, Smolak, Kaczmarek & Michalczyk 2015 [T] [m]

Macrobotus paulinae sp. nov. (Stec et al. 2015)

Terra typica: Kenya (Africa)

Kenya:

- $02^{\circ}39'15.75''N$, $36^{\circ}56'9.99''E$; 1,824 m asl: Marsabit County, Mount Kulal Biosphere Reserve, Kulal Mt., near Gatab, compact high, dense and shady forest moss on dead fallen tree (*Chionanthus* sp.). **Stec et al. (2016)**

Record numbers. Kenya: 1; **total: 1.**

Remarks. This species of *hufelandi* group is currently endemic to the Kenya.

134. *Macrobotus persimilis* Binda & Pilato, 1972 [T]

M. persimilis (Ramløv & Kristensen 1985)

Macrobotus persimilis Binda e Pilato, 1971 (Binda & Pilato 1987)

Terra typica: Italy (Europe)

Libya:

- $32^{\circ}49'N$, $21^{\circ}51'E$; 600 m asl: Jabal al Akhdar District, Cyrene, moss. **Pilato & Pennisi (1976)**
- $32^{\circ}29'N$, $20^{\circ}50'E$; 350 m asl: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Morocco:

- $32^{\circ}25'N$, $05^{\circ}13'W$; 1,750 m asl: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on soil and fallen branches and stems. **Ramløv & Kristensen (1985)**

Tunisia:

- $36^{\circ}57'N$, $08^{\circ}45'E$; 0 m asl: Jendouba Governorate, surroundings of Tabarka. **Binda & Pilato (1987)**

Record numbers. Libya: 2; Morocco: 1, Tunisia: 1; **total: 4.**

Remarks. *Macrobotus persimilis* is largely Palaearctic (McInnes 1994) with reports from a few disjunct sites. The *persimilis* sub-group of the *hufelandi* group requires careful taxonomic identification. These reports are close to the Sicilian type locale, though this example requires further analysis.

135. *Macrobotus ragonesei* Binda, Pilato, Moncada & Napolitano, 2001 [T]

Macrobotus ragonesei n. sp. (Binda et al. 2001)

Macrobotus ragonesei Binda, Pilato, Moncada & Napolitano 2001 (Pilato et al. 2003)

Terra typica: Democratic Republic of Congo (Africa)

Democratic Republic of Congo:

- $00^{\circ}04'S$, $29^{\circ}18'E$; 1,950 m asl: North Kivu Province, outskirts of Lukanga, lichen. **Pilato et al. (2003)**
- $01^{\circ}10'S$, $28^{\circ}28'E$; 1,000 m asl: **Type Locality:** North Kivu Province, outskirts of Mohanga, moss (*Campylopus* cf. *fragilis*). **Binda et al. (2001)**

Record numbers. Democratic Republic of Congo: 2; **total: 2.**

Remarks. This species is currently endemic to the Democratic Republic of Congo.

136. *Macrobotus rubens* Murray, 1907d sensu lato [T]

M. rubens Murray (Murray 1913)

Terra typica: India (Asia)

Kenya:

- $00^{\circ}01'S$, $37^{\circ}54'E$: Undefined locality, British East Africa [Kenya], moss. **Murray (1913)**

Record numbers. Kenya: 1; **total: 1.**

Remarks. *Macrobotus rubens* has a very disjunct distribution (McInnes 1994), however, the few taxonomic characters in the original description (Murray 1907d), preclude correct identification. This taxon is in urgent need of a detail re-description based on material from the type locality.

137. *Macrobotus sapiens* Binda & Pilato, 1984 [T]

Terra typica: Italy (Europe)

Namibia:

- 24°07'S, 15°56'E: Undefined locality, Namib Desert, lichen. **Pilato et al. (1991)**

Record numbers. Namibia: 1; **total: 1.**

Remarks. This to *hufelandi* group species with a disjunct distribution (McInnes 1994) requires careful taxonomic analysis, including egg morphology, to properly differentiate the individual species (see Bertolani & Rebecchi 1993 for the review).

138. *Macrobotus topali* Iharos, 1969b [T]

Macrobotus topali (Iharos 1969a)

Terra typica: India (Asia)

Cameroon:

- 04°57'N, 09°56'E; 800 m asl: Littoral Region, Kongsamba [Nkongsamba], moss on tree. **Iharos (1969a)**

Record numbers. Cameroon: 1; **total: 1.**

Remarks. This species has only been reported twice; from the type locality and West Africa.

Genus: *Mesobiotus* Vecchi, Cesari, Bertolani, Jönsson, Rebecchi & Guidetti, 2016

139. *Mesobiotus arguei* Pilato & Sperlinga, 1975 [T]

Terra typica: Italy (Europe)

Algeria:

- 34°40'N, 06°11'E; 0 m asl: Biskra Province, 30 km from Biskra, El Oued [Zeribet el Oued]. **Binda & Pilato (1987)**

Record numbers. Algeria: 1; **total: 1.**

Remarks. The distribution comprises three Europe type locality, Algeria and China (Yang 2007), locations.

140. *Mesobiotus diffusus* Binda & Pilato, 1987 [T]

Macrobotus diffusus n. sp. (Binda & Pilato 1987)

Terra typica: Tunisia (Africa)

Algeria:

- 36°49'N, 05°47'E; 0 m asl: Jijel Province, Jijel, Les Aftis beach (Ziama Monsouria). **Binda & Pilato (1987)**
- 36°40'N, 05°09'E; 50 m asl: Béjaïa Province, Tichi [Tichy]. **Binda & Pilato (1987)**

Libya:

- 32°29'N, 20°50'E; 350 m asl: Marj District, Barce [Marj]. **Pilato et al. (2006)**

Tunisia:

- 36°57'N, 08°45'E; 0 m asl: Jendouba Governorate, surroundings of Tabarka. **Binda & Pilato (1987)**
- 36°46'N, 08°41'E; 650 m asl: **Type Locality:** Jendouba Governorate, surroundings of Ain Draham [Ayn Drahim]. **Binda & Pilato (1987), Pilato et al. (2006)**

Record numbers. Algeria: 2, Libya: 1, Tunisia: 2; **total: 5.**

Remarks. A distribution comprising the type locale, Italy, Russia and New Zealand (McInnes 1994, Pilato & Binda 1996, Biserov 1998).

141. *Mesobiotus harmsworthi* Murray, 1907c *sensu lato* [T]

M. echinogenitus Richters (Murray 1907a)

M. harmsworthi Murray (Murray 1913)

Macrobotus harmsworthi Murray (Pardi 1941)

Macrobotus harmsvorthi (Ramløv & Kristensen 1985)

Terra typica: Franz Joseph Land (Russia, Barents Sea)

Algeria:

- 36°53'N, 07°39'E; **800 m asl:** Annaba Province, Massif of Eldough [Edough Mountains]. **Binda & Pilato (1987)**
- 36°40'N, 04°36'E; **1,400 m asl:** Tizi Ouzou Province, Akfadou Forest. **Binda & Pilato (1987)**
- 36°38'N, 05°45'E; **1,200 m asl:** Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**
- 36°28'N, 04°14'E; **1,700 m asl:** Tizi Ouzou Province, Massif of Djurdjura (Assouille depression). **Binda & Pilato (1987)**

Ethiopia:

- 04°03'N, 38°19'E; 1,700 m asl: Oromia Region, Mēga, former English residence, moss (*Pleurochaete* sp.) on tree (*Juniperus procera*). **Pardi (1941)**

Libya:

- 32°29'N, 20°50'E; 350 m asl: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**

Morocco:

- 32°25'N, 05°13'W; 1,750 m asl: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on limestone boulders in the forest glade. **Ramløv & Kristensen (1985)**

Republic of South Africa:

- 29°44'S, 22°44'E: Undefined locality, Cape Colony [Cape Province]. **Murray (1907a), Marcus (1928)**

Uganda:

- 01°22'N, 32°17'E: Undefined locality. **Murray (1913)**

Record numbers. Algeria: 4, Ethiopia: 1, Libya: 1, Morocco: 1, Republic of South Africa: 1, Uganda: 1; **total: 9.**

Remarks. While *Mesobiotus harmsworthi sensu lato* has a cosmopolitan distribution (McInnes 1994), we think the presence of *M. harmsworthi sensu stricto* in Africa is questionable. Originally described from Zemlya Frantsa-Iosifa in Arctic Russia (Murray 1907c), *M. harmsworthi* is now considered a species group, with a number of very similar species (all requiring careful taxonomic analysis of adults and egg morphology—see Kaczmarek *et al.* 2011 for diagnostic key). This is particularly emphasised by the presence of taxa reported from Africa (e.g. *M. diffusus*, *M. nuragicus*, etc.).

142. *Mesobiotus montanus* Murray, 1910 [T]

M. montanus John Murr. ?1906 (Marcus 1936)

Terra typica: South Island (New Zealand)

Ivory Coast:

- 07°24'N, 07°33'W; 400 m asl: Tonkpi Region, above Man, the Ko, just above the water line of a mountain stream, wet moss on rocks. **Marcus (1933)**

Record numbers. Ivory Coast: 1; **total: 1.**

Remarks. This record, of four specimens from a particularly hydric habitat is unusual. Though originally described from New Zealand the (current) global distribution (McInnes 1994a), suggests a species complex for which all records should be re-analysed.

143. *Mesobiotus nuragicus* Pilato & Sperlinga, 1975 [T]

Terra typica: Italy (Europe)

Algeria:

- 36°38'N, 05°45'E; 1,200 m asl: Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**

Republic of South Africa:

- 26°57'S, 32°51'E; 0 m asl: KwaZulu-Natal Province, Kosi, topsoil. **Binda (1984)**

Record numbers. Algeria: 1, Republic of South Africa: 1; **total: 2.**

Remarks. This species from the *harmsworthi* group, which requires careful taxonomic analysis including egg morphology (Kaczmarek *et al.* 2011), has a rather disjunct distribution (McInnes 1994). The eight eggs reported from South Africa (Binda 1984), are subtly different from the type material and therefore needs confirmation.

144. *Mesobiotus radiatus* Pilato, Binda & Catanzaro, 1991 [T]

Macrobiotus radiatus n. sp. (Pilato *et al.* 1991)

Macrobiotus radiatus Pilato, Binda & Catanzaro 1991 (Binda *et al.* 2001)

Terra typica: Tanzania (Africa)

Democratic Republic of Congo:

- 00°04'S, 29°18'E; 1,950 m asl: North Kivu Province, outskirts of Lukanga, liverwort (*Plagiochila porelloides*) (1 sample) and moss (*Entodon* sp.) (1 sample). **Binda *et al.* (2001)**
- 01°10'S, 28°28'E; 1,000 m asl: North Kivu Province, outskirts of Mohanga, lichen (1 sample) and moss (*Brachythecium velutinum*) (1 sample). **Binda *et al.* (2001)**

Tanzania:

- 03°09'S, 35°29'E: **Type Locality:** Undefined locality, Arusha Region, Ngorongoro Volcano, mosses. **Pilato *et al.* (1991)**

Record numbers. Democratic Republic of Congo: 2, Tanzania: 1; **total: 3.**

Remarks. This relatively recently described species has a central, tropical African distribution.

145. *Mesobiotus sicheli* Binda, Pilato & Lisi, 2005 [T]

Macrobiotus furciger Murray, 1906 (Binda 1984)

Macrobiotus sicheli sp. nov. (Binda *et al.* 2005)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- 34°01'S, 23°55'E; 200 m asl: **Type Locality**: Eastern Cape Province, Tzitzikama [Tsitsikamma National Park], moss. **Binda (1984), Binda et al. (2005)**

Record numbers. Republic of South Africa: 1; **total: 1.**

Remarks. This species belongs to the *furciger* group and is currently endemic to the Republic of South Africa. Species of the *furciger*-group appear global; though many dated descriptions require verification using modern taxonomy (for more details see Binda & Rebecchi 1992 and Binda et al. 2005).

146. *Mesobiotus snaresensis* Horning, Schuster & Grigarick, 1978 [T]

Macrobiotus snaresensis Horning, Schuster & Grigarick 1978 (Binda & Pilato 1995a)

Terra typica: Snares Islands (New Zealand)

Tanzania:

- 03°12'S, 37°31'E; 2,200–2,400 m asl: Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1995a)**

Record numbers. Tanzania: 1; **total 1.**

Remarks. At present, this species from the *harmsworthi* group is known only from New Zealand and Tanzania. All species from this group are quite similar and require careful taxonomic analysis of adults and egg morphology (see Kaczmarek et al. 2011 for diagnostic key).

Genus: *Minibiotus* Schuster, 1980

147. *Minibiotus africanus* Binda & Pilato, 1995a [T]

Minibiotus africanus n. sp. (Binda & Pilato 1995a)

Minibiotus africanus Binda & Pilato 1995 (Binda et al. 2001)

Terra typica: Tanzania (Africa)

Democratic Republic of Congo:

- 01°10'S, 28°28'E; 1,000 m asl: North Kivu Province, outskirts of Mohanga, liverwort (1 sample) and moss (*Entodon* sp.) (1 sample). **Binda et al. (2001)**

Tanzania:

- 03°12'S, 37°31'E; 2,200–2,400 m asl: **Type Locality**: Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1995a)**

Record numbers. Democratic Republic of Congo: 1, Tanzania: 1; **total: 2.**

Remarks. This species is currently endemic to Africa.

148. *Minibiotus allani* (Murray, 1913)

Macrobiotus allani sp. n. (Murray 1913)

Terra typica: Kenya (Africa)

Kenya:

- 01°15'S, 36°41'E; 2,000 m asl: **Type Locality**: Kiambu County, Kikuyu, moss. **Murray (1913)**

Record numbers. Kenya: 1; **total: 1.**

Remarks. This species has been reported from a few disjunct localities (McInnes 1994), though the rather dated original description needs a re-description using type material or new material from the type locality.

149. *Minibiotus crassidens* (Murray, 1907a) [T]

M. crassidens sp. n. Murray (1907a)

Macrobiotus crassidens Murray (Murray 1913)

Macrobiotus crassidens John Murray 1907 (da Cunha & do Nascimento 1964)

Terra typica: Republic of South Africa (Africa)

Angola:

- 14°55'S, 13°30'E; 1,750 m asl: Huila Province, surroundings of Sá da Bandeira [Lubango], lichens. **da Cunha & do Nascimento (1964)**

Democratic Republic of Congo:

- 01°25'S, 29°27'E: Undefined locality, North Kivu Province, Albert National Park [Virunga National Park], soil. **Teunissen (1938)**

Kenya:

- *01°15'S, 36°41'E; 2,000 m asl*: Kiambu County, Kikuyu, moss. **Murray (1913)**

Republic of South Africa:

- *25°45'S, 28°11'E; 1,300 m asl*: Gauteng Province, Pretoria, moss. **Murray (1913)**
- *29°44'S, 22°44'E*: **Type Locality**: Undefined locality, Cape Colony [Cape Province], moss. **Murray (1907a)**

Uganda:

- *01°22'N, 32°17'E*: Undefined locality, moss. **Murray (1913)**

Record numbers. Angola: 1, Democratic Republic of Congo: 1, Kenya: 1, Republic of South Africa: 2, Uganda: 1; **total: 6.**

Remarks. The dated and limited reports from a few disjunct localities (McInnes 1994), suggest this taxon requires a re-description using type material or new material from the type locality.

150. *Minibiotus ethelae* Claxton, 1998

Minibiotus ethelae n. sp. (Claxton 1998)

Terra typica: Australia

Republic of South Africa:

- *23°51'S, 31°34'E*: Undefined locality, Limpopo Province, Kruger National Park, lichens on dead twigs. **Claxton (1998)**
- *25°05'S, 30°27'E; 2,250 m asl [1,400 m asl]*: Transvaal [Mpumalanga Province], Lydenberg [Lydenburg]; lichens. **Claxton (1998)**
- *25°11'S, 30°46'E; 1,400 m asl*: Mpumalanga Province, Hendriksdaal, Palmers Creek, rock. **Claxton (1998)**
- *25°14'S, 28°30'E; 1,500 m asl*: Undefined locality, Limpopo Province, Rus-Te-Winter National Reserve [Rust de Winter Nature Reserve], bark of *Acacia*. **Claxton (1998)**
- *28°57'S, 29°11'E; 1,600 m asl*: Natal [KwaZulu-Natal Province], Drakensberg Mountains, Cathedral Rock Area, Indumeni Forest, moss on rock. **Claxton (1998)**

Record numbers. Republic of South Africa: 5; **total: 5.**

Remarks. This species, similar to *Minibiotus furcatus*, has not been reported outside South Africa and the type locale (Claxton 1998).

151. *Minibiotus furcatus* (Ehrenberg, 1859) sensu lato [T]

Macrobotus furcatus Ehrbg. (Marcus 1933)

Macrobotus furcatus Ehrenberg 1858 (da Cunha & do Nascimento 1964)

Terra typica: Switzerland (Europe)

Angola:

- *07°25'S, 15°06'E; 850 m asl*: Uíge Province, Mahondo, lichens. **da Cunha & do Nascimento (1964)**
- *07°47'S, 15°01'E; 650 m asl*: Uíge Province, near Carmona [Uíge], Estate at Pumba Loge, lichens. **da Cunha & do Nascimento (1964)**
- *14°55'S, 13°30'E; 1,750 m asl*: Huíla Province, surroundings of Sá da Bandeira [Lubango], mosses and lichens. **da Cunha & do Nascimento (1964)**

Namibia:

- *21°24'S, 17°14'E; 1,600 m asl [1,450 m asl]*: Otjozondjupa Region, Otjiwarongo between Windhoek and Waterberg. **Marcus (1933)**

Record numbers. Angola: 3, Namibia: 1; **total: 4.**

Remarks. This largely Holarctic species (McInnes 1994) was re-described by Binda & Pilato (1992). With the recognised species *Minibiotus ethelae* in South Africa we believe the presence of *furcatus* in Africa needs confirmation.

152. *Minibiotus granatai* (Pardi, 1941) [T]

Macrobotus granatai sp. n. (Pardi 1941)

Terra typica: Ethiopia (Africa)

Ethiopia:

- *04°03'N, 38°19'E; 1,700 m asl*: **Type Locality**: Oromia Region, Mēga, dry sprig of *Juniperus procera* with minimal traces of lichens (1 samples), lichens on tree (*Juniperus procera*) (3 samples), plant (Angiospermae) thicket going to former English residence, on tree (*Juniperus procera*) (5 samples). **Pardi (1941)**

Record numbers. Ethiopia: 1; **total: 1.**

Remarks. This species has not been reported since the original description from the type locale in Ethiopia.

153. *Minibiotus harrylewisi* Meyer & Hinton, 2009 [T]

Minibiotus harrylewisi sp. n. (Meyer & Hinton 2009)

Terra typica: Republic of South Africa (Africa)

Republic of South Africa:

- 29°44'S, 30°32'E; 750 m asl: **Type Locality:** KwaZulu-Natal Province, Tala Private Game Reserve, lichen on tree (*Acacia*). **Meyer & Hinton (2009)**

Record numbers. Republic of South Africa: 1; **total: 1.**

Remarks. This species is currently endemic to the Republic of South Africa.

154. *Minibiotus hufelandioides* (Murray, 1910) [T]

Macrobotus hufelandioides Murray (?), *Macrobotus hufelandioides* Murray (Murray 1913)

Macrobotus hufelandioides Murray, 1910 (Van Rompu *et al.* 1991a)

Terra typica: Australia

Kenya:

- 00°01'S, 37°54'E: Undefined locality, British East Africa [Kenya], moss. **Murray (1913)**

Republic of South Africa:

- 23°50'S, 29°59'E; 1,450 m asl: North Transvaal [Limpopo Province], Woodbush [Woodbush Forest Reserve]. **Murray (1913)**

Tanzania:

- 03°17'S, 37°31'E; **ca. 1,500 m asl:** Kilimanjaro Region, Kilimanjaro National Park, Marangu gate, rain forest, below tree line, river, pH 5.5, water temperature 12°C, benthos sample. **Van Rompu *et al.* (1991a)**

Uganda:

- 01°22'N, 32°17'E: Undefined locality, moss. **Murray (1913)**

Record numbers. Kenya: 1, Republic of South Africa: 1, Tanzania: 1, Uganda: 1; **total: 4.**

Remarks. Known from several disjunct localities (McInnes 1994) suggesting a species complex. Murray (1913) described several differences between his African samples and those from the type locale (Australia) concluding that the African examples were, “possibly a distinct species”. These comments and more recently described African conspecifics suggests the presence of this taxon in Africa needs confirmation.

155. *Minibiotus intermedius* (Plate, 1888) *sensu lato* [T]

Macrobotus intermedius Plate. (Pardi 1941, Iharos 1978)

M. intermedius Plate (Murray (1913)

Macrobotus intermedius Plate 1888 (da Cunha & do Nascimento 1964)

Macrobotus intermedius (Iharos 1969a)

Minibiotus intermedius (Plate, 1889) (Pilato *et al.* 1991, Fontoura *et al.* 2010)

Minibiotus intermedius Plate 1888 (Binda *et al.* 2001)

Minibiotus intermedius (Middleton 2003)

Terra typica: Chile (South America)

Angola:

- 07°25'S, 15°06'E; 850 m asl: Uíge Province, Mahondo, mosses and lichens. **da Cunha & do Nascimento (1964)**
- 07°47'S, 15°01'E; 650 m asl: Uíge Province, near Carmona [Uíge], Estate at Pumba Loge, mosses and lichens. **da Cunha & do Nascimento (1964)**
- 14°55'S, 13°30'E; 1,750 m asl: Huíla Province, surroundings of Sá da Bandeira [Lubango], mosses and lichens. **da Cunha & do Nascimento (1964)**

Botswana:

- 19°10'S, 23°25'E; 950 m asl: North West District, Moremi, moss or lichen on tree or rock. **Middleton (2003)**

Cameroon:

- 04°57'N, 09°56'E; 800 m asl: Littoral Region, Kongsamba [Nkongsamba], moss on tree. **Iharos (1969a)**
- 04°39'N, 09°25'E; **600 m asl** [400 m asl]: Southwest Region, Kumba, shore of Lake Barombi Mbo, protected rainforest, moss on tree. **Iharos (1969a)**
- 04°12'N, 09°12'E; **2,900–3,000 m asl:** Southwest Region, Mount Cameroon National Park, Mount Cameroon, moss on tree and lava blocks. **Iharos (1969a)**
- 04°11'N, 09°12'E; **1,950–2,050 m asl:** Southwest Region, Mount Cameroon National Park, Mount Cameroon, S side, grassy lava field and the area of the timberline by trees and lava. **Iharos (1969a)**
- 04°10'N, 09°13'E; **1,300–1,500 m asl:** Southwest Region, Mount Cameroon National Park, Mount Cameroon, rainforest, moss on tree. **Iharos (1969a)**

Democratic Republic of Congo:

- 01°10'S, 28°28'E; 1,000 m asl: North Kivu Province, outskirts of Mohanga, moss (*Entodon* sp.). **Binda *et al.* (2001)**

Ethiopia:

- 04°03'N, 38°19'E; 1,700 m asl: Oromia Region, Mēga, former English residence moss from tree (*Juniperus procera*). **Pardi (1941)**

Kenya:

- 00°01'S, 37°54'E: Undefined locality, British East Africa [Kenya], moss. **Murray (1913)**

Lesotho:

- 29°35'S, 29°17'E; 2,900 m asl: Thaba-Tseka District, Sani Pass, lichen on stone fence. **Meyer & Hinton (2009)**

Republic of South Africa:

- 24°38'S, 30°51'E; 1,800 m asl: Undefined locality, Gauteng or Mpumalanga Province, Dragon Mountains, near the canyon of Blade River, moss on soil in the grass. **Kaczmarek & Michalczyk (2004b)**
- 28°13'S, 31°57'E; 350 m asl: KwaZulu-Natal Province, Hluhluwe-Imfolozi Game Park, lichen on tree (*Acacia*). **Meyer & Hinton (2009)**
- 29°44'S, 30°32'E; 750 m asl: KwaZulu-Natal Province, Tala Private Game Reserve, lichen on tree (*Acacia*). **Meyer & Hinton (2009)**
- 34°01'S, 23°55'E; 200 m asl: Eastern Cape Province, Tzitzikama [Tzitsikamma National Park], moss. **Binda (1984)**

Tanzania:

- 03°09'S, 35°29'E: Undefined locality, Arusha Region, Ngorongoro Volcano, mosses. **Pilato et al. (1991)**
- 34°01'S, 23°55'E; 200 m asl: Eastern Cape Province, Tzitzikama [Tzitsikamma National Park], moss. **Pilato et al. (1991)**

Tunisia:

- 36°57'N, 08°45'E; 0 m asl: Jendouba Governorate, surroundings of Tabarka. **Binda & Pilato (1987)**
- 36°46'N, 08°41'E; 700 m asl: Jendouba Governorate, surroundings of Ain Draham, forest of *Quercus sauber* and *Q. libanotis*, moss on soil. **Iharos (1978)**
- 36°46'N, 08°41'E; 700 m asl: Jendouba Governorate, Ain Draham, moss on rock. **Iharos (1978)**

Record numbers. Angola: 3, Botswana: 1, Cameroon: 5, Democratic Republic of Congo: 1, Ethiopia: 1, Kenya: 1, Lesotho: 1, Republic of South Africa: 4, Tanzania: 2, Tunisia: 3; **total: 22.**

Remarks. Originally described from Chile (Plate 1888), *Minibiotus intermedius* was considered cosmopolitan (e.g. McInnes 1994) though modern taxonomy has shown it to be a species complex (Claxton 1998). It is most probable that non-Neotropical records for *Minibiotus intermedius* actually refer to different taxon within the species-group; several of which have been recently described from African locations. All African records for *M. intermedius* should be re-examined.

Genus: *Paramacrobotus* Guidetti, Schill, Bertolani, Dandekar & Wolf, 2009**156. *Paramacrobotus areolatus* (Murray, 1907c) *sensu lato* [T]**

Macrobotus areolatus Murray, 1907 (Binda 1984, Binda & Pilato 1987)

Paramacrobotus cf. *areolatus* (Murray, 1907)? (Gąsiorek et al. 2017)

Terra typica: Svalbard (Spitsbergen)

Algeria:

- 36°40'N, 04°36'E; 1,400 m asl: Tizi Ouzou Province, Akfadou Forest. **Binda & Pilato (1987)**

Mozambique:

- 23°52'S, 35°23'E; 0 m asl: Inhambene Province, Inhambene, moss. **Binda (1984)**

Tunisia:

- 37°10'46"N, 10°15'11"E; 120 m asl: Bizerte Governorate, Raf Raf, forest, moss on soil. **Gąsiorek et al. (2017)**
- 36°53'57"N, 10°18'19"E; 67 m asl: Tunis Governorate, Gammarth, rural, moss on soil. **Gąsiorek et al. (2017)**
- 36°46'30"N, 08°44'23"E; 636 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- 36°47'51"N, 08°52'24"E; 590 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- 36°45'59"N, 08°47'52"E; 561 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- 36°44'20"N, 08°43'43"E; 511 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- 36°44'13"N, 08°40'59"E; 765 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- 36°43'45"N, 08°44'11"E; 373 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- 36°43'43"N, 08°40'50"E; 742 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- 36°43'20"N, 08°40'58"E; 668 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- 36°43'19"N, 08°43'30"E; 474 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- 36°42'48"N, 08°43'30"E; 371 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
- 36°42'10"N, 08°40'46"E; 462 m asl: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**

Record numbers. Algeria: 1, Mozambique: 1, Tunisia: 13; **total: 15.**

Remarks. The genus *Paramacrobotus* (until recently a species-group within *Macrobotus*) has been divided into *richtersi* and *areolatus* (with and without macroplacoid, respectively) species groups. *Paramacrobotus areolatus*, once considered cosmopolitan (McInnes 1994), is now recognised as the nominal species for a group of very similar taxa that require careful taxonomic examination of adults and egg morphology for correct identification. A few new (including African) species of the *areolatus* group (e.g. Michalczyk & Kaczmarek 2006b, Degma et al. 2008, Kaczmarek et al. 2014b). Both Richters (1908) and Binda (1984) pre-date the taxonomic changes and failed to find eggs, essential for correct species identification. This, in

conjunction with *P. areolatus* being originally described from the Arctic, implies all African records should be treated with caution until relevant examples are re-examined or new African material is confirmed.

157. *Paramacrobilotus kenianus* Schill, Förster, Dandekar & Wolf, 2010 [T]

Macrobilotus 'richtersi groups' 1 and 2 (Hengherr *et al.* 2008, 2009a)

Macrobilotus 'richtersi groups' 2 and 1 (Hengherr *et al.* 2009b)

Macrobilotus 'richtersi groups' 2 and 3 (Guidetti *et al.* 2009)

Paramacrobilotus kenianus sp. nov. (Schill *et al.* 2010)

Terra typica: Kenya (Africa)

Kenya:

- 00°18'S; 36°05'E; 1,800 m asl: **Type Locality:** Nakuru County, Nakuru, moss. **Hengherr *et al.* (2008, 2009a,b), Guidetti *et al.* (2009), Schill *et al.* (2010)**
- 00°43'S; 36°26'E; 1,900 m asl: Nakuru County, Naivasha, moss. **Hengherr *et al.* (2008, 2009a,b), Guidetti *et al.* (2009), Schill *et al.* (2010)**

Record numbers. Kenya: 2; **total: 2.**

Remarks. This species, identified only via DNA barcoding and biophysical data, is morphologically identical to *P. richtersi* (Guidetti *et al.* 2009, Schill *et al.* 2010). The International Commission of the Zoological Nomenclature code states, "An author, when drawing up the description of a new nominal taxon, should include comparisons with appropriate related taxa in order to assist later identification of the taxon. Name-bearing type material should be illustrated (or a reference given to such illustration)." (<http://www.nhm.ac.uk/hosted-sites/iczn/code/index.jsp?nfv=true&booksection=appendixB>). This taxon, in the absence of such illustration, remains a cryptic species identifiable only via DNA and biophysical data. Currently endemic to Kenya.

158. *Paramacrobilotus privitera* (Binda, Pilato, Moncada & Napolitano, 2001) [T]

Macrobilotus privitera n. sp. (Binda *et al.* 2001)

Terra typica: Guinea (Africa)

Guinea:

- 11°06'N, 13°49'W; 200 m asl: **Type Locality:** Boké Region, Sangarédi, moss (*Isopterigium tenerum*). **Binda *et al.* (2001)**

Record numbers. Guinea: 1; **total: 1.**

Remarks. This species belongs to *richtersi* group and is currently endemic to Guinea.

159. *Paramacrobilotus richtersi* (Murray, 1911) *sensu lato* [T]

Macrobilotus richtersi Murray (Murray 1913, Pardi 1941)

Macrobilotus schultzei Greeff 1866 (Rahm 1936)

Macrobilotus richtersi J. Murray, 1911 (Rodriguez-Roda 1947)

Macrobilotus schultzei Greeff 1866 (Rahm 1936, da Cunha & do Nascimento 1964)

Macrobilotus richtersi (Iharos 1969a)

Macrobilotus richtersi J. Murr., (1911) (Binda 1971)

Macrobilotus richtersi J. Murr., 1911 (Pilato 1972)

Macrobilotus richtersi Murray, 1911 (Pilato & Pennisi 1976, Binda 1984, Binda & Pilato 1987, Van Rompu *et al.* 1995, Meyer & Hinton 2009)

Macrobilotus richtersi J. Murr. (Iharos 1978)

M. richtersi (Ramløv & Kristensen 1985)

M. richtersi J. Murray, 1911 (Séméria 1986)

Macrobilotus cf. *richtersi* Murray, 1911 (Middleton 2003, Kaczmarek & Michalczyk 2004b)

Paramacrobilotus cf. *richtersi* (Murray, 1911)? (Gąsiorek *et al.* 2017)

Terra typica: Ireland (Europe)

Algeria:

- 36°49'N, 05°47'E; 0 m asl: Jijel Province, Jijel, Les Aftis beach (Ziama Monsouria). **Binda & Pilato (1987)**
- 36°46'N, 05°06'E; 400 m asl: Béjaïa Province, Pic des Singes. **Binda & Pilato (1987)**
- 36°40'N, 05°09'E; 50 m asl: Béjaïa Province, Tichi [Tichy]. **Binda & Pilato (1987)**
- 36°38'N, 05°45'E; 1,200 m asl: Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**
- 36°28'N, 04°14'E; 1,700 m asl: Tizi Ouzou Province, Massif of Djurdjura (Assouille depression). **Binda & Pilato (1987)**
- 34°40'N, 06°11'E; 0 m asl: Biskra Province, 30 km from Biskra, El Oued [Zeribet el Oued]. **Binda & Pilato (1987)**

Angola:

- 07°47'S, 15°01'E; 650 m asl: Uíge Province, near Carmona [Uíge], Estate at Pumba Loge, mosses and lichens. **da Cunha & do Nascimento (1964)**

- *14°44'S, 15°01'E*: Undefined locality, Huíla Province, Impaca, mosses and lichens. **da Cunha & do Nascimento (1964)**
- Cameroon:**
- *04°57'N, 09°56'E; 800 m asl*: Littoral Region, Kongsamba [Nkongsamba], moss on tree. **Iharos (1969a)**
 - *04°13'N, 09°10'E; 4,000 m asl*: Southwest Region, Mount Cameroon National Park, Mount Cameroon, near fumaroles (80°C), moss on soil. **Iharos (1969a)**
 - *04°12'N, 09°12'E; 2,900–3,000 m asl*: Southwest Region, Mount Cameroon National Park, Mount Cameroon, moss on trees and lava blocks. **Iharos (1969a)**
 - *04°11'N, 09°12'E; 1,900–1,950 m asl*: Southwest Region, Mount Cameroon National Park, Mount Cameroon, primeval forest, above bothy No. 1, moss on trees and lava. **Iharos (1969a)**
 - *04°10'N, 09°13'E; 1,300–1,500 m asl*: Southwest Region, Mount Cameroon National Park, Mount Cameroon, rainforest, moss on tree. **Iharos (1969a)**
 - *04°10'N, 09°13'E; 1,660–1,800 m asl*: Southwest Region, Mount Cameroon National Park, Mount Cameroon, rainforest, moss on tree. **Iharos (1969a)**
- Equatorial Guinea:**
- *03°39'N, 08°49'E; 1,500 m asl*: Fernando Póo [Bioko Island], Bioko Norte Province, Pico Basilé, among mosses and liverworts. **Rodriguez-Roda (1947)**
- Ethiopia:**
- *04°03'N, 38°19'E; 1,700 m asl*: Oromia Region, Mēga, former English residence, moss (*Pleurochaete* sp.) on tree (*Juniperus procera*), moss in stream, moss on (*Juniperus procera*) and moss (*Neckera* sp.) from tree (*Juniperus procera*) (4 samples). **Pardi (1941)**
- Gabon:**
- *00°18'N, 09°30'E; 10–40 m asl*: Estuaire Province, near Libreville, Owendo, moss on tree. **Iharos (1969a)**
 - **Israel and Palestinian National Authority:**
 - *32°53'N, 35°34'E; -200 m asl*: N shore of Sea of Galilee, Capernaum, moss (*Hypnum* sp.). **Rahm (1936)**
- Kenya:**
- *00°01'S, 37°54'E*: Undefined locality, British East Africa [Kenya], moss. **Murray (1913)**
- Lesotho:**
- *29°19'S, 27°29'E; 1,550 m asl*: Maseru District, Maseru, moss or lichen on tree or rock. **Middleton (2003)**
 - *29°38'S, 27°31'E; 1,750 m asl*: Maseru District, Morija, moss or lichen on tree or rock. **Middleton (2003)**
- Libya:**
- *32°29'N, 20°50'E; 350 m asl*: Marj District, Barce [Marj], moss. **Pilato & Pennisi (1976)**
- Morocco:**
- *33°31'N, 05°07'W; 1,650 m asl*: Meknès-Tafilalet Region, Ras al Ma [Res el Ma], mosses on trees (*Cedrus*) and rocks. **Séméria (1986)**
 - *32°56'N, 05°40'W; 1,700 m asl [850 m asl]*: Meknès-Tafilalet Region, Khenifra [Khénifra], moss. **Binda (1971), Pilato (1972)**
 - *32°25'N, 05°13'W; 1,750 m asl*: Meknès-Tafilalet Region, S of Azrou, cedar forest, moss on basalt boulders in the forest glade. **Ramløv & Kristensen (1985)**
 - *31°08'N, 07°55'W; 1,700 m asl*: Tadla Tadla-Azilal Region, Imlil, walnut forest, moss on limestone cliffs. **Ramløv & Kristensen (1985)**
- Republic of South Africa:**
- *24°38'S, 30°51'E; 1,800 m asl*: Undefined locality, Gauteng or Mpumalanga Province, Dragon Mountains, near the canyon of Blade River, moss on soil in the grass. **Kaczmarek & Michalczyk (2004b)**
 - *25°45'S, 28°11'E; 1,300 m asl*: Gauteng Province, Pretoria, moss. **Murray (1913)**
 - *29°44'S, 22°44'E*: Undefined locality, Cape Colony [Cape Province]. **Murray (1913)**
 - *29°44'S, 30°32'E; 750 m asl*: KwaZulu-Natal Province, Tala Private Game Reserve, lichen on tree (*Acacia*). **Meyer & Hinton (2009)**
 - *34°01'S, 23°55'E; 200 m asl*: Eastern Cape Province, Tizitzikama/ Tzitzikama [Tsitsikamma National Park], moss. **Binda (1984)**
- Tunisia:**
- *36°57'N, 08°45'E; 0 m asl*: Jendouba Governorate, surroundings of Tabarka. **Binda & Pilato (1987)**
 - *36°53'57"N, 10°18'19"E; 67 m asl*: Tunis Governorate, Gammaarth, rural, lichen on tree and moss on soil (2 samples). **Gąsiorek et al. (2017)**
 - *36°46'N, 08°41'E; 700 m asl*: Jendouba Governorate, surroundings of Ain Draham, forest of *Quercus sauber* and *Q. libanotis*, moss on soil and vegetable debris mixed with soil (2 samples). **Iharos (1978)**
 - *36°43'19"N, 08°43'30"E; 474 m asl*: Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**
 - *36°07'N, 08°30'E; 350 m asl*: Kef Governorate, along the road between El Kef and Sakiet, 23 km W El Kef, Qued el Kohl, scrub, sparse vegetation, with stony ground and thin layer of surface soil, soil with vegetable debris or litter under trees (*Pinus halepensis* and *Juniperus phoenicis*). **Iharos (1978)**
 - *36°07'N, 08°32'E; 450 m asl*: Kef Governorate, along road from El Kef and Sakiet, 21 km W El Kef, strongly insolated area, lichen on soil and moss on soil mixed with fine-grained soil (2 samples). **Iharos (1978)**

- **36°22'55"N, 10°07'03"E; 357 m asl:** Zaghouan Governorate, Zaghouan, forest, mosses on soil (4 samples). **Gąsiorek et al. (2017)**

Uganda:

- **01°22'N, 32°17'E:** Undefined locality. **Murray (1913)**

Zimbabwe:

- **17°46'S, 31°03'E; 1,500 m asl:** Harare City, Tobacco Research Board, nematology seed bed site, under grass, dry soil. **Van Rompu et al. (1995)**
- **18°20'S, 26°28'E; 700 m asl:** Matabeleland North Province, 370 km from Bulawayo, beyond Hwange village, along the road to Livingstone, mopane forest, dry soil. **Van Rompu et al. (1995)**
- **18°44'S, 26°57'E; 1,100 m asl:** Matabeleland North Province, Hwange National Park, near Main Camp, under grass and shrubs, dry sandy soil. **Van Rompu et al. (1995)**
- **18°56'S, 27°46'E; 1,000 m asl:** Matabeleland North Province, 182 km from Bulawayo alongside the road to Hwange, Lupane, around a tree, dry sandy soil with some organic debris. **Van Rompu et al. (1995)**
- **20°06'S, 31°00'E; 1,050 m asl:** Masvingo Province, Popoteke Gorge [Popoteke Gorge], along the river, under reeds, humid soil. **Van Rompu et al. (1995)**
- **20°26'S, 28°31'E; 1,350 m asl:** Matabeleland South Province, Matobo National Park, Matopos, Moth Shrine, under grass, dry soil. **Van Rompu et al. (1995)**
- **20°29'S, 28°31'E; 1,350 m asl:** Matabeleland South Province, Matobo National Park, Matopos, close to the parking near White Rhino Cave, dry river bed, under grass and mopane tree, dry soil. **Van Rompu et al. (1995)**
- **20°31'S, 29°21'E; 1,100 m asl:** Matabeleland South Province, right side of the road from Masvingo to Bulawayo, 175 km from Masvingo, under shrubs and mopane tree, dry soil. **Van Rompu et al. (1995)**
- **20°32'S, 28°28'E; 1,350 m asl:** Matabeleland South Province, Matobo National Park, Matopos, Nswatugi Cave, 10 m from the parking, under grass and various trees, dry soil. **Van Rompu et al. (1995)**
- **20°33'S, 28°31'E; 1,400 m asl:** Matabeleland South Province, Matobo National Park, Matopos, left from the path to Pomongwe Cave, 10 m before the cave, under various trees, dry soil. **Van Rompu et al. (1995)**
- **21°27'S, 32°04'E; 200 m asl:** Masvingo Province, Gonarezhou National Park [South Gonarezhou National Park], Mwatambo viewpoint, under grass and shrubs, dry soil. **Van Rompu et al. (1995)**

Record numbers. Algeria: 6, Angola: 2, Cameroon: 6, Equatorial Guinea: 1, Ethiopia: 1, Gabon: 1, Israel and Palestinian National Authority: 1, Kenya: 1, Lesotho: 2, Libya: 1, Morocco: 4, Republic of South Africa: 5, Tunisia: 7, Uganda: 1, Zimbabwe: 11; **total: 50.**

Remarks. *Paramacrobrotus richtersi* was, until recently, believed to be cosmopolitan (McInnes 1994). New data has shown that this is the nominal species for a species complex – the ‘*richtersi* group’ – requiring careful examination of both adults and eggs. Most African reports pre-date the taxonomic re-assessment and several lack eggs, so proper identification cannot be confirmed (e.g. Van Rompu et al. (1995), whose drawings could be interpreted as an adult of the *M. harmsworthi* group). *Paramacrobrotus richtersi* was originally described from Europe (Murray, 1911), suggesting ‘some confusion’ and that all African records should be treated with caution until the original material is re-examined or the species is otherwise verified from the region.

160. *Paramacrobrotus sklodowskiae* (Michalczyk, Kaczmarek & Węglarska, 2006) [T]

Paramacrobrotus sklodowskiae (Michalczyk et al., 2006) (Gąsiorek et al. 2017)

Terra typica: Cyprus (Europe)

Tunisia:

- **36°43'20"N, 08°40'58"E; 668 m asl:** Jendouba Governorate, Beni M'tir, forest, moss and moss and lichen on soil (2 samples). **Gąsiorek et al. (2017)**
- **36°22'55"N, 10°07'03"E; 357 m asl:** Zaghouan Governorate, Zaghouan, forest, lichen on soil. **Gąsiorek et al. (2017)**

Record numbers. Tunisia: 2; **total: 2.**

Remarks. Reported from Cyprus and Tunisia, indicates a Mediterranean distribution (Gąsiorek et al. 2017).

161. *Paramacrobrotus vanescens* (Pilato, Binda & Catanzaro, 1991) [T]

Macrobrotus vanescens n. sp. (Pilato et al. 1991)

Macrobrotus vanescens Pilato, Binda & Catanzaro 1991 (Binda & Pilato 1995a, Pilato et al. 2003)

Terra typica: Tanzania (Africa)

Democratic Republic of Congo:

- **00°04'S, 29°18'E; 1,950 m asl:** North Kivu Province, outskirts of Lukanga, liverwort (*Targionia hypophylla*). **Pilato et al. (2003)**

Guinea:

- **09°31'N, 13°42'W; 0 m asl:** Conakry Region, Conkary, moss (*Barbula* sp.). **Pilato et al. (2003)**

Republic of Zambia:

- **17°55'S, 25°52'E; 890 m asl:** Southern Province, near Livingstone, in the Victoria Falls gorge, mosses and leaf litter on

soil. **Zawierucha et al. (2012)**

Tanzania:

- *03°09'S, 35°29'E*: **Type Locality:** Undefined locality, Arusha Region, Ngorongoro Volcano, mosses. **Pilato et al. (1991)**
- *03°12'S, 37°31'E*; **2,200–2,400 m asl:** Kilimanjaro Region, near Marangu [gate], outskirts of the entrance of Kilimanjaro National Park, mosses. **Binda & Pilato (1995a)**

Record numbers. Democratic Republic of Congo: 1, Guinea: 1, Republic of Zambia: 1, Tanzania: 2; **total: 5.**

Remarks. This species belongs to *richtersi* group and is currently reported from a central band across Africa.

Genus: *Richtersius* Pilato & Binda, 1989

162. *Richtersius coronifer* (Richters, 1903) sensu lato [T]

Macrobotus coronifer F. Richters, 1903 (Teunissen 1938)

Macrobotus coronifer Richt. (Iharos 1978)

Richtersia coronifer (Richters, 1903) (Binda & Pilato 1987)

Terra typica: Svalbard (Spitsbergen) (Norway, Arctic Ocean)

Algeria:

- *36°40'N, 04°36'E*; **1,400 m asl:** Tizi Ouzou Province, Akfadou Forest. **Binda & Pilato (1987)**
- *36°38'N, 05°45'E*; **1,200 m asl:** Jijel Province, M'Sid-Ech-Cheta (Texenna Pass). **Binda & Pilato (1987)**
- *36°28'N, 04°14'E*; **1,700 m asl:** Tizi Ouzou Province, Massif of Djurdjura (Assouille depression). **Binda & Pilato (1987)**

Democratic Republic of Congo:

- *01°24'S, 29°15'E*; **2,100 m asl:** North Kivu Province, Albert National Park [Virunga National Park], “Mayumba” - mountain primary forest island in the plain of lava on the volcano Nyamuragira, soil. **Teunissen (1938)**

Tunisia:

- *36°46'36"N, 08°42'45"E*; **784 m asl:** Jendouba Governorate, Beni M'tir, urban, moss on soil. **Gąsiorek et al. (2017)**
- *36°46'N, 08°41'E*; **700 m asl:** Jendouba Governorate, surroundings of Ain Draham, moss and lichen on tree (*Quercus sauber*). **Iharos (1978)**
- *36°44'21"N, 08°43'47"E*; **516 m asl:** Jendouba Governorate, Beni M'tir, forest, moss on soil. **Gąsiorek et al. (2017)**

Record numbers. Algeria: 3, Democratic Republic of Congo: 1, Tunisia: 3; **total: 7.**

Remarks. This largely Holarctic distribution, appears focused in the Arctic, sub-Arctic and montane regions (McInnes 1994). African records appear restricted to northern and montane localities.

Genus: *Xerobiotus* Bertolani & Biserov, 1996

163. *Xerobiotus pseudohufelandi* (Iharos, 1966b) [T]

M. pseudohufelandii (Ramløv & Kristensen 1985)

Macrobotus pseudohufelandi Iharos, 1966 (Binda & Pilato 1987)

Terra typica: Austria (Europe)

Morocco:

- *31°35'N, 05°36'W*; **1,650–1800 m asl:** Souss-Massa-Drâa Region, Todra [Todgha] Gorge, sparse grass vegetation and few low bushes, moss on limestone cliffs (orthoceratite lime). **Ramløv & Kristensen (1985)**

Tunisia:

- *36°57'N, 08°45'E*; **0 m asl:** Jendouba Governorate, surroundings of Tabarka. **Binda & Pilato (1987)**

Record numbers. Morocco: 1, Tunisia: 1; **total: 2.**

Remarks. This species has only been reported from a few Palaearctic localities (McInnes 1994).

Family: Murrayidae Guidetti, Gandolfi, Rossi & Bertolani, 2005

Genus: *Dactylobiotus* Schuster, 1980

164. *Dactylobiotus ambiguus* (Murray, 1907e) [F]

?*Macrobotus ambiguus* J. Murr. (Marcus 1933)

Dactylobiotus ambiguus (Ramløv & Kristensen 1985)

Terra typica: Hungary (Europe)

Algeria:

- 30°32'N, 02°55'E; 350 m asl: Ghardaïa Province, El Golea [El Ménia], lakes in the oasis, on the banks of a weak saline lake, between aquatic plants. **Marcus (1933)**

Morocco:

- 31°35'N, 05°36'W; 1,650 m asl: Souss-Massa-Drâa Region, Todra [Todgha] Gorge, moss from running water (source at the hotel). **Ramløv & Kristensen (1985)**
- 30°53'N, 07°14'W; 1,400 m asl: Souss-Massa-Drâa Region, camp at Iriri River, sludge and algae from running water. **Ramløv & Kristensen (1985)**

Record numbers. Algeria: 1, Morocco: 2; **total: 3.**

Remarks. Distribution is largely Palaearctic or high latitude Holarctic (McInnes 1994a). *Dactylobiotus* species require careful analysis of both adults and eggs for confident identification (e.g. Kaczmarek *et al.* 2012b) and, as Marcus (1933) questioned his identification because the eggs were not found and Ramløv & Kristensen (1985) make no mention of eggs, these North African records need to be confirmed.

165. *Dactylobiotus dispar* (Murray, 1907f) *sensu lato* [F]

Macrobiotus dispar (Löffler 1968)

Macrobiotus dispar Murray, 1907 (d'Hondt 1977, Haspeslagh 1982)

D. dispar (Ramløv & Kristensen 1985)

Dactylobiotus dispar Murray, 1907 (De Smet & Bafort 1990)

Terra typica: Hungary (Europe)

Algeria:

- 32°46'N, 00°25'W; 1,000 m asl: Naâma Province, sub-prefecture of Ain Sefra, pre-Saharan oasis of Tiout, wadi Rouiba (permanent wadi) situated along the road leading to Ain-Sefra at the site of rock engravings Tiout, plankton sample. **d'Hondt (1977)**

Kenya:

- 00°01'S, 37°15'E; 2,500 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Sirimon River, cascade, bamboo. **De Smet & Bafort (1990)**
- 00°03'S, 37°34'E; 2,140 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Marimba River, rushes. **De Smet & Bafort (1990)**
- 00°09'S, 37°18'E; 4,345 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Oblong Tarn, shore, sediments and gravel. **Haspeslagh (1982)**
- 00°09'S, 37°18'E; 4,485 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Nanyuki Tarn, shore, silt with plant debris and sandy gravel. **Haspeslagh (1982)**
- 00°09'S, 37°18'E; 4,488 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Hut Tarn, west shore, silt with plant debris and sandy gravel. **Löffler (1968), Haspeslagh (1982)**
- 00°09'S, 37°19'E; 4,439 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Upper Kami Tarn, shore, sediments. **Haspeslagh (1982)**
- 00°09'S, 37°19'E; 4,439 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Lower Kami Tarn, shore, sediments. **Haspeslagh (1982)**
- 00°09'S, 37°21'E; 4,293 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Greatest Hall Tarn, shore, sediments. **Haspeslagh (1982)**
- 00°10'S, 37°17'E; 4,150 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Teleki River, moss. **De Smet & Bafort (1990)**
- 00°10'S, 37°18'E; 4,270 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Teleki Tarn, small effluent and shallow pond, silt, sediments and sandy gravel. **Haspeslagh (1982)**
- 00°10'S, 37°19'E; 4,310 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Upper Thompson Tarn, shore, sediments. **Haspeslagh (1982)**
- 00°10'S, 37°19'E; 4,450 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Gallery Tarn, shore, sediments. **Haspeslagh (1982)**
- 00°10'S, 37°19'E; 4,574 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Lewis Tarn, shore, fine sediments on rock. **Haspeslagh (1982)**

Morocco:

- 31°35'N, 05°36'W; 1,650 m asl: Souss-Massa-Drâa Region, Todra [Todgha] Gorge, moss from running water (source at the hotel). **Ramløv & Kristensen (1985)**
- 30°53'N, 07°14'W; 1,400 m asl: Souss-Massa-Drâa Region, camp at Iriri River, sludge and algae from running water. **Ramløv & Kristensen (1985)**

Tanzania:

- 03°06'S, 37°20'E; ca. 3,900 m asl: Kilimanjaro Region, Kilimanjaro National Park, upper Kibo, above tree line, rivulet, benthos sample. **Van Rompu *et al.* (1991a)**
- 03°08'S, 37°26'E; 3,780 m asl: Kilimanjaro Region, Kilimanjaro National Park, Horombo trail, above tree line, river, benthos sample. **Van Rompu *et al.* (1991a)**

- *03°09'S, 37°26'E; ca. 3,600 m asl*: Kilimanjaro Region, Kilimanjaro National Park, Horombo trail, above tree line, river benthos sample. **Van Rompu et al. (1991a)**

Record numbers. Algeria: 1, Kenya: 13, Morocco: 2, Tanzania: 3; **total: 19.**

Remarks. All *Dactylobiotus* species require careful analysis of adults and eggs (e.g. Kaczmarek et al. 2012b). Records of this this largely Holarctic species (McInnes 1994), implies the African records need re-assessment.

166. *Dactylobiotus luci* Kaczmarek, Michalczyk & Eggermont, 2008 [F]

Dactylobiotus luci n. sp. (Kaczmarek et al. 2008)

Terra typica: Uganda (Africa)

Uganda:

- **00°18.385'N, 29°53.080'E; 4,250 m asl**: Western Region, Kasese District, Rwenzori Mountains National Park, Zaphania's Pool, *Carex-Sphagnum* fens. **Kaczmarek et al. (2008)**

Record numbers. Uganda: 1; **total: 1.**

Remarks. This recently described species is currently endemic to Uganda.

167. *Dactylobiotus macronyx* (Dujardin, 1851) sensu lato [F]

Macrobiotus macronyx Duj. (Marcus 1933)

Macrobiotus macronyx Dujardin (Teunissen 1938)

Macrobiotus macronyx Dujardin, 1851 (d'Hondt 1977)

Terra typica: France (Europe)

Algeria:

- *32°46'N, 00°25'W; 1,000 m asl*: Naâma Province, Aïn Sefra, Reservoir of Tiout Oasis, dry *Bryum* turf. **Marcus (1933)**
- *28°02'N, 01°40'E*: Undefined numerous freshwater localities. **Seurat (1930)** quoting **Gauthier (1928)**

Democratic Republic of Congo:

- *01°11'S, 29°27'E; 1,200 m asl*: North Kivu Province, Albert National Park [Virunga National Park], Rodahira River near Rutshuru, a tributary of the Fuku. **Teunissen (1938)**

Record numbers. Algeria: 1, Democratic Republic of Congo: 1; **total: 2.**

Remarks. This is the nominal species for the genus, but still has an uncertain diagnosis (e.g. Murray 1907f, Binda & Pilato 1999a, Kaczmarek et al. 2012b). Mainly reported from the Holarctic (McInnes 1994).

Genus: *Murrayon* Bertolani & Pilato, 1988

168. *Murrayon dianae* (Kristensen, 1982) [F]

Macrobiotus dianae Kristensen, 1980 (Van Rompu et al. 1991a)

Terra typica: Greenland (Arctic)

Tanzania:

- *03°06'S, 37°25'E; ca. 4,250 m asl*: Kilimanjaro Region, Kilimanjaro National Park, Kibo trail, below saddle between Kibo and Horombo, above tree line, alpine meadow, dense vegetation, stagnant water (swamp), benthos sample. **Van Rompu et al. (1991a)**
- *03°07'S, 37°21'E; ca. 4,000 m asl*: Kilimanjaro Region, Kilimanjaro National Park, Barranco trail, above tree line, slow running ice covered brooklet, benthos sample. **Van Rompu et al. (1991a)**

Record numbers. Tanzania: 2; **total: 2.**

Remarks. The African records of this species, all of which lack details of egg structure, appear anomalous alongside the mainly Arctic and sub-Arctic localities in Greenland (McInnes 1994) and Canada (Collins & Bateman 2001, Van Rompu et al. 1991b, 2000), and require confirmation.

169. *Murrayon hastatus* (J. Murray, 1907) [T]

Macrobiotus hastatus J.Murray, 1907 (Rahm 1936)

Terra typica: Scotland (Europe)

Israel and Palestinian National Authority:

- *31°46'N, 35°13'E; 800 m asl*: Judean Mountains, Jerusalem, St Anna church, at the Pool of Bethesda, humid climate, shady and moist environment, moss (*Hypnum* sp.) on rock. **Rahm (1936)**

Record numbers. Israel and Palestinian National Authority: 1; **total: 1.**

Remarks. This relatively rare species has a largely Palaearctic distribution.

170. *Murrayon pullari* (Murray, 1907e) [F/T]

Macrobiotus pullari J. Murr (Marcus 1933)

Macrobiotus Pullari J. Murray (Marcus 1935)
Macrobiotus pullari (Teunissen 1938)
Murrayon cfr. *pullari* Murray (Löffler 1968)
Macrobiotus pullari Murray, 1907 (Haspesslagh 1982)
Murrayon cf. *pullari* (Murray, 1907) (Kaczmarek *et al.* 2008)
Terra typica: Scotland (Europe)

Democratic Republic of Congo:

- $01^{\circ}25'S, 29^{\circ}27'E$: Undefined locality, North Kivu Province, Albert National Park [Virunga National Park], soil. **Teunissen (1938)**

Ivory Coast:

- $07^{\circ}16'N, 08^{\circ}10'W$; 350 m asl: Tonkpi Region, 90 km W of Man, Danané, small swamp in the jungle. **Marcus (1933)**

Kenya:

- $01^{\circ}06'N, 34^{\circ}33'E$; ca. 4,000 m: Bungoma County, Mount Elgon, Station 20, small watercourse north of the IVth camp. **Marcus (1935)**
- $00^{\circ}05'S, 37^{\circ}20'E$; 4,000 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Hook Tarn. **Löffler (1968)**
- $00^{\circ}07'S, 37^{\circ}22'E$; 3,900 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Hinde Valley, moss from creek. **Löffler (1968)**
- $00^{\circ}09'S, 37^{\circ}18'E$; 4,345 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Oblong Tarn, shore, sediments and gravel. **Haspesslagh (1982)**
- $00^{\circ}09'S, 37^{\circ}18'E$; 4,352 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Hausburg Tarn, shore, sediments. **Haspesslagh (1982)**
- $00^{\circ}09'S, 37^{\circ}18'E$; 4,485 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Nanyuki Tarn, shore, silt with plant debris and sandy gravel. **Haspesslagh (1982)**
- $00^{\circ}09'S, 37^{\circ}18'E$; 4,488 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Hut Tarn, on diatom growth. **Löffler (1968)**; shore, silt with plant debris and sandy gravel. **Haspesslagh (1982)**
- $00^{\circ}09'S, 37^{\circ}19'E$; 4,439 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Lower Kami Tarn, shore, sediments. **Haspesslagh (1982)**
- $00^{\circ}09'S, 37^{\circ}19'E$; 4,439 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Upper Kami Tarn, shore, sediments. **Haspesslagh (1982)**
- $00^{\circ}09'S, 37^{\circ}19'E$; 4,500 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Upper Simba Tarn. **Löffler (1968)**
- $00^{\circ}09'S, 37^{\circ}21'E$; 4,293 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Great Hall Tarn, shore, sediments. **Löffler (1968), Haspesslagh (1982)**
- $00^{\circ}09'S, 37^{\circ}21'E$; 4,300 m asl: Meru County, Mount Kenya National Park, Mount Kenya, North Hall Tarn. **Löffler (1968)**
- $00^{\circ}10'S, 37^{\circ}18'E$; 4,270 m asl: Nyeri County, Mount Kenya National Park, Mount Kenya, Teleki Tarn, small effluent and shallow pond, silt, sediments and sandy gravel. **Haspesslagh (1982)**
- $00^{\circ}10'S, 37^{\circ}19'E$; 4,310 m asl: Meru County, Mount Kenya National Park, Mount Kenya, Upper Thompson Tarn, shore, sediments. **Haspesslagh (1982)**
- $00^{\circ}39'S, 36^{\circ}43'E$; 3,500 m: Muranga County, Kinangop Mountains in Aberdare (North of Nairobi), Station 48, small, muddy source. **Marcus (1935)**

Uganda:

- $00^{\circ}18.385'N, 29^{\circ}53.080'E$; 4,250 m asl: Western Region, Kasese District, Rwenzori Mountains National Park, Zaphania's Pool, Carex-Sphagnum fens. **Kaczmarek *et al.* (2008)**

Record numbers. Democratic Republic of Congo: 1, Ivory Coast: 1, Kenya: 15, Uganda: 1; **total: 18.**

Remarks. This is a largely Holarctic species (McInnes 1994), so the few South American (Kaczmarek *et al.* 2015) and tropical African records, could indicate new sibling taxa of *M. pullari*.

Discussion

Overview. The African data comprises 170 species from ca. 260 localities (Tables 1–2), of which only 29 (ca. 17%) are endemic to Africa (see Table 1). Species, listed by country, are provided in Table 2 as a quick checklist for the benefit of readers interested in the fauna of specific countries rather than species distribution for the whole of Africa.

Status of knowledge. The above data, Table 1 and Figure 2, clearly show the very limited literature for this region, with few local areas of intense study (South Africa) and vast swathes of Africa with limited or no information (Figure 2). Much of the literature is dated (pre 1950s) and very little has been produced since some major revisions in tardigrade taxonomy. Many of the earlier surveys report examples of species that are now considered species-complexes, or have made erroneous conclusions using European and/or North American biased

literature. Indeed, even Murray (1907e) commented that, “till quite recently few supposed that there were numerous species of Tardigrada”, and the view that tardigrade species are ubiquitous and cosmopolitan has persisted. Re-examination of these early samples, if available, is recommended to verify all reported species and diagnose potential cryptic taxa. The original biogeographic synthesis (McInnes 1994a) stimulated numerous studies of both well explored and new regions and it is hoped this more detailed biogeography will highlight and elicit more work on the unexplored regions, and African biodiversity hotspots (Burgess *et al.* 2004; CEPF 2016).

TABLE 1. Zoogeographic, taxonomic and ecological information summarised by country listed alphabetically. Endemic taxa = endemic to each country.

Countries	Genera	Species/ subspecies	Dubious records	Endemic taxa	Endemism	Terrestrial/ freshwater/ amphibious
?Africa	1	1	1	0	0%	1/0/0
Algeria	15	36	16	1	3%	31/2/3
Angola	9	16	10	2	13%	16/0/0
Botswana	4	5	4	0	0%	5/0/0
Cameroon	10	15	8	0	0%	14/0/1
Democratic Republic of Congo	13	25	9	3	12%	22/1/2
Equatorial Guinea	5	5	4	1	20%	5/0/0
Ethiopia	6	8	6	1	13%	6/0/0
Gabon	2	2	2	0	0%	2/0/0
Guinea	1	2	0	1	50%	2/0/0
Israel and Palestinian National Authority	9	12	8	0	0%	12/0/0
Ivory Coast	3	4	1	0	0%	2/1/1
Kenya	13	27	17	3	11%	23/3/1
Lesotho	5	5	4	0	0%	5/0/0
Libya	13	22	8	1	5%	21/0/1
Malawi	1	1	0	1	100%	0/1/0
Morocco	16	35	14	0	0%	31/3/1
Mozambique	4	4	2	0	50%	3/0/1
Namibia	5	5	3	0	0%	5/0/0
Republic of South Africa	17	42	13	7	17%	41/0/1
Republic of Zambia	4	4	0	1	25%	4/0/0
Rwanda	3	3	2	0	0%	3/0/0
Somalia	2	2	1	1	50%	2/0/0
Tanzania	19	30	11	3	10%	24/4/2
Tunisia	16	28	15	1	4%	28/0/0
Uganda	14	17	9	2	12%	14/2/1
Uganda/Kenya	1	1	0	0	0%	1/0/0
Zimbabwe	5	5	3	0	0%	5/0/0

Introduced species and “Endemism”. As observed for the New World (Kaczmarek *et al.* 2014, Kaczmarek *et al.* 2015, Kaczmarek *et al.* 2016), a number of tardigrades reported show extremely disjunct distributions. While it is possible these may be explained in terms of anthropogenic or animal vectors, prevailing trade winds and ocean currents, the African literature is so poor that simple misidentification is equally plausible. To verify introduced species requires good regional baseline data, where ‘new’ taxa could be attributed to transport enhanced dispersal. Unfortunately, our knowledge of African tardigrade fauna falls well short of being able to support this type of analysis.

Tardigrades are small, potentially easily transported as eggs and tuns, and potentially ubiquitous. Even so, the current paradigm suggests that few, if any, species are cosmopolitan and most have more local distributions (e.g. Bertolani & Rebecchi 1993, Pilato & Binda 2001). This indeed corroborates the relatively high levels of “endemism” apparent in the data (Table 1); though this is augmented by focusing on particular habitats, which may not necessarily overlap with other adjacent regions. Surveys of African tardigrades are regionally clustered, suggesting that many currently ‘endemic’ species are probably more widespread and that even small-scale surveys will yield significant numbers of new species.

TABLE 2. Tardigrade taxa found in South America, listed alphabetically by genera and species/subspecies with countries in which they have been found.

Country	Species
?Africa	<i>Echiniscus merokensis</i>
Algeria	<i>Cornechiniscus cornutus</i> , <i>Echiniscus bisetosus</i> , <i>E. canadensis</i> , <i>E. granulatus</i> , <i>E. merokensis</i> , <i>E. trisetosus</i> , <i>Hypsibius convergens</i> , <i>H. dujardini</i> , <i>H. microps</i> , <i>H. scabropygus</i> , <i>Adropion belgicae</i> , <i>Astatumen bartosi</i> , <i>A. trinacriae</i> , <i>Platicrista angustata</i> , <i>Pilatobius bullatum</i> , <i>Hexapodibius bindae</i> , <i>Isohypsibius arbiter</i> , <i>I. austriacus</i> , <i>I. deconincki</i> , <i>I. elegans</i> , <i>I. lunulatus</i> , <i>I. macrodactylus</i> , <i>Parhexapodibius lagrecai</i> , <i>Macrobiotus echinogenitus</i> , <i>M. hufelandi</i> , <i>M. islandicus</i> , <i>Mesobiotus arguei</i> , <i>M. diffusus</i> , <i>M. harmsworthi</i> , <i>M. nuragicus</i> , <i>Paramacrobiotus areolatus</i> , <i>P. richtersi</i> , <i>Richtersius coronifer</i> , <i>Dactylobiotus ambiguus</i> , <i>D. dispar</i> , <i>D. macronyx</i>
Angola	<i>Bryodelphax parvulus</i> , <i>Echiniscus africanus</i> , <i>E. angolensis</i> , <i>E. limai</i> , <i>E. m. suecicus</i> , <i>Pseudechiniscus suillus</i> , <i>Milnesium tardigradum</i> , <i>Ramazzottius oberhaeuseri</i> , <i>Isohypsibius pseudoundulatus</i> , <i>I. sattleri</i> , <i>Macrobiotus hufelandi</i> , <i>M. occidentalis</i> , <i>Minibiotus crassidens</i> , <i>M. furcatus</i> , <i>M. intermedius</i> , <i>Paramacrobiotus richtersi</i>
Botswana	<i>Echiniscus angolensis</i> , <i>E. bigranulatus</i> , <i>Milnesium tardigradum</i> , <i>Macrobiotus hufelandi</i> , <i>Minibiotus intermedius</i>
Cameroon	<i>Echiniscus bigranulatus</i> , <i>E. testudo</i> , <i>E. wendti</i> , <i>Pseudechiniscus suillus</i> , <i>Hypsibius convergens</i> , <i>H. dujardini</i> , <i>H. maculatus</i> , <i>Adropion scoticum</i> , <i>Fractonotus caelatus</i> , <i>Doryphoribius flavus</i> , <i>Isohypsibius cameruni</i> , <i>Macrobiotus hufelandi</i> , <i>M. topali</i> , <i>Minibiotus intermedius</i> , <i>Paramacrobiotus richtersi</i>
Democratic Republic of Congo	<i>Echiniscus crassispinosus</i> , <i>E. perarmatus</i> , <i>E. pusae</i> , <i>E. reticulatus</i> , <i>Milnesium tardigradum</i> , <i>Diphascon pingue</i> , <i>Hypsibius dujardini</i> , <i>H. multituberculatus</i> , <i>Itaquascon biserovi</i> , <i>Isohypsibius arbiter</i> , <i>I. lunulatus</i> , <i>I. prosostomus</i> , <i>I. sattleri</i> , <i>Macrobiotus echinogenitus</i> , <i>Macrobiotus hufelandi</i> , <i>M. iharosi</i> , <i>M. ragonesei</i> , <i>Mesobiotus radiatus</i> , <i>Minibiotus africanus</i> , <i>M. crassidens</i> , <i>M. intermedius</i> , <i>Paramacrobiotus vanescens</i> , <i>Richtersius coronifer</i> , <i>Dactylobiotus macronyx</i> , <i>Murrayon pullari</i>
Equatorial Guinea	<i>Echiniscus pooensis</i> , <i>Hypsibius convergens</i> , <i>Adropion scoticum ommatophorum</i> , <i>Macrobiotus hufelandi</i> , <i>Paramacrobiotus richtersi</i>
Ethiopia	<i>Pseudechiniscus suillus</i> , <i>Milnesium tardigradum</i> , <i>Isohypsibius nodosus</i> , <i>Macrobiotus hufelandi</i> , <i>Mesobiotus harmsworthi</i> , <i>Minibiotus granatai</i> , <i>M. intermedius</i> , <i>Paramacrobiotus richtersi</i>
Gabon	<i>Isohypsibius schaudinni</i> , <i>Paramacrobiotus richtersi</i>
Guinea	<i>Paramacrobiotus privitera</i> , <i>P. vanescens</i>
Israel and Palestinian National Authority	<i>Echiniscus blumi</i> , <i>E. testudo</i> , <i>Pseudechiniscus suillus</i> , <i>Milnesium tardigradum</i> , <i>Diphascon alpinum</i> , <i>Hypsibius scabropygus</i> , <i>Ramazzottius oberhaeuseri</i> , <i>Macrobiotus echinogenitus</i> , <i>M. hufelandi</i> , <i>M. occidentalis</i> , <i>Paramacrobiotus richtersi</i> , <i>Murrayon hastatus</i>
Ivory Coast	<i>Isohypsibius granulifer</i> , <i>I. asper</i> , <i>Mesobiotus montanus</i> , <i>Murrayon pullari</i>
Jordan	<i>Cornechiniscus lobatus</i> , <i>Echiniscus testudo</i> , <i>Milnesium tardigradum</i> , <i>Mesocrista spitzbergensis</i> , <i>Ramazzottius oberhaeuseri</i>
Kenya	<i>Echiniscus crassispinosus</i> , <i>E. quadrispinosus</i> , <i>Pseudechiniscus facettalis</i> , <i>Pseudechiniscus suillus</i> , <i>Milnesium tardigradum</i> , <i>Hypsibius arcticus</i> , <i>H. convergens</i> , <i>Ramazzottius oberhaeuseri</i> , <i>Doryphoribius maasaimarensis</i> , <i>Isohypsibius granulifer</i> , <i>I. indicus</i> , <i>I. nodosus</i> , <i>I. prosostomus</i> , <i>I. schaudinni</i> , <i>I. tuberculatus</i> , <i>Pseudobiotus</i> sp., <i>Macrobiotus hufelandi</i> , <i>M. paulinae</i> , <i>M. rubens</i> , <i>Minibiotus allani</i> , <i>M. crassidens</i> , <i>M. hufelandioides</i> , <i>M. intermedius</i> , <i>Paramacrobiotus kenianus</i> , <i>P. richtersi</i> , <i>Dactylobiotus dispar</i> , <i>Murrayon pullari</i>

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TABLE 2. (Continued)

Lesotho	<i>Echiniscus africanus</i> , <i>Milnesium tardigradum</i> , <i>Macrobiotus hufelandi</i> , <i>Minibiotus intermedius</i> , <i>Paramacrobiotus richtersi</i>
Libya	<i>Bryodelphax parvulus</i> , <i>B. tatrensis</i> , <i>Cornechiniscus cornutus</i> , <i>Echiniscus blumi</i> , <i>E. carusoi</i> , <i>E. testudo</i> , <i>Parechiniscus chitonides</i> , <i>Hypsibius convergens</i> , <i>Pilatobius granifer</i> , <i>Ramazzottius libycus</i> , <i>Doryphoribius doryphorus</i> , <i>Eremobiotus alicatai</i> , <i>Isohypsibius austriacus</i> , <i>I. brulloi</i> , <i>I. elegans</i> , <i>I. sattleri</i> , <i>Macrobiotus echinogenitus</i> , <i>M. hufelandi</i> , <i>M. persimilis</i> , <i>Mesobiotus diffusus</i> , <i>M. harmsworthi</i> , <i>Paramacrobiotus richtersi</i>
Malawi	<i>Isohypsibius malawiensis</i>
Morocco	<i>Bryodelphax parvulus</i> , <i>Cornechiniscus lobatus</i> , <i>Echiniscus bisculptus</i> , <i>E. bisetosus</i> , <i>E. blumi</i> , <i>E. canadensis</i> , <i>E. granulatus</i> , <i>E. mediantus</i> , <i>E. spiniger</i> , <i>E. testudo</i> , <i>E. trisetosus</i> , <i>Pseudechiniscus suillus</i> , <i>Milnesium tardigradum</i> , <i>Diphascon alpinum</i> , <i>D. higginsi</i> , <i>Hypsibius dujardini</i> , <i>Astatumen trinacriae</i> , <i>Ramazzottius oberhaeuseri</i> , <i>Isohypsibius brevispinosus</i> , <i>I. brulloi</i> , <i>I. pappi</i> , <i>I. prosostomus</i> , <i>I. ronsisvallei</i> , <i>I. sattleri</i> , <i>I. asper</i> , <i>I. tuberculatus</i> , <i>Pseudobiotus</i> sp., <i>Macrobiotus echinogenitus</i> , <i>M. hufelandi</i> , <i>M. persimilis</i> , <i>Mesobiotus harmsworthi</i> , <i>Paramacrobiotus richtersi</i> , <i>Xerobiotus pseudohufelandi</i> , <i>Dactylobiotus ambiguus</i> , <i>D. dispar</i>
Mozambique	<i>Apodibius nuntius</i> , <i>Isohypsibius kristenseni</i> , <i>Macrobiotus naskreckii</i> , <i>Paramacrobiotus areolatus</i>
Namibia	<i>Echiniscus kerguelensis</i> , <i>Milnesium tardigradum</i> , <i>Hypsibius scabropygus</i> , <i>Macrobiotus sapiens</i> , <i>Minibiotus furcatus</i>
Republic of South Africa	<i>Echiniscus africanus</i> , <i>E. bigranulatus</i> , <i>E. crassispinosus</i> , <i>E. c. fasciatus</i> , <i>E. duboisi</i> , <i>E. longispinosus</i> , <i>E. perarmatus</i> , <i>E. pusae</i> , <i>Pseudechiniscus bispinosus</i> , <i>P. jiroveci</i> , <i>P. suillus</i> , <i>Milnesium tardigradum</i> , <i>Diphascon zaniewi</i> , <i>Hypsibius arcticus</i> , <i>H. convergens</i> , <i>H. maculatus</i> , <i>Adropion scoticum</i> , <i>Astatumen trinacriae</i> , <i>Ramazzottius oberhaeuseri</i> , <i>Ramazzottius szeptycki</i> , <i>R. theroni</i> , <i>Doryphoribius bindae</i> , <i>Haplohexapodibius seductor</i> , <i>Isohypsibius deconincki</i> , <i>I. nodosus</i> , <i>I. sattleri</i> , <i>Paradiphascon manningi</i> , <i>Calcarobiotus (Calcarobiotus) filmeri</i> , <i>C. (C.) occultus</i> , <i>Macrobiotus drakensbergi</i> , <i>Macrobiotus echinogenitus</i> , <i>M. hufelandi</i> , <i>M. iharosi</i> , <i>Mesobiotus harmsworthi</i> , <i>M. nuragicus</i> , <i>M. sicheli</i> , <i>Minibiotus crassidens</i> , <i>M. ethelae</i> , <i>Minibiotus harrylewisi</i> , <i>M. hufelandioides</i> , <i>M. intermedius</i> , <i>Paramacrobiotus richtersi</i>
Republic of Zambia	<i>Milnesium tetralamellatum</i> , <i>Doryphoribius niedbalai</i> , <i>Calcarobiotus (Calcarobiotus) parvicalcar</i> , <i>Paramacrobiotus vanescens</i>
Rwanda	<i>Echiniscus duboisi</i> , <i>Ramazzottius oberhaeuseri</i> , <i>Macrobiotus hufelandi</i>
Somalia	<i>Echiniscus migiurtinus</i> , <i>Milnesium tardigradum</i>
Tanzania	<i>Echiniscus africanus</i> , <i>E. angolensis</i> , <i>E. cirinoi</i> , <i>E. scabrospinosus</i> , <i>Pseudechiniscus jiroveci</i> , <i>P. suillus</i> , <i>Milnesium tetralamellatum</i> , <i>Diphascon pingue</i> , <i>Hypsibius dujardini</i> , <i>Adropion scoticum</i> , <i>Itaquiscon umbellinae</i> , <i>Parascon schusteri</i> , <i>Acutuncus antarcticus</i> , <i>Ramazzottius szeptycki</i> , <i>Doryphoribius maranguensis</i> , <i>Isohypsibius papillifer</i> , <i>I. p. bulbosus</i> , <i>Calcarobiotus (Discrepunguis) polygonatus</i> , <i>Macrobiotus hibiscus</i> , <i>M. hufelandi</i> , <i>M. iharosi</i> , <i>M. occidentalis</i> , <i>Mesobiotus radiatus</i> , <i>M. snaresensis</i> , <i>Minibiotus africanus</i> , <i>M. hufelandioides</i> , <i>M. intermedius</i> , <i>Paramacrobiotus vanescens</i> , <i>Dactylobiotus dispar</i> , <i>Murrayon dianeae</i>
Tunisia	<i>Bryodelphax maculatus</i> , <i>Echiniscus blumi</i> , <i>E. testudo</i> , <i>Pseudechiniscus facettalis</i> , <i>P. suillus</i> , <i>Milnesium dornensis</i> , <i>M. tardigradum</i> , <i>Diphascon pingue</i> , <i>Hypsibius convergens</i> , <i>H. pallidus</i> , <i>H. scabropygus</i> , <i>Adropion prorsirostre</i> , <i>A. scoticum</i> , <i>Astatumen trinacriae</i> , <i>Pilatobius bullatum</i> , <i>P. patanei</i> , <i>Isohypsibius elegans</i> , <i>I. sattleri</i> , <i>Macrobiotus hufelandi</i> , <i>M. humilis</i> , <i>M. persimilis</i> , <i>Mesobiotus diffusus</i> , <i>Minibiotus intermedius</i> , <i>Paramacrobiotus areolatus</i> , <i>P. richtersi</i> , <i>P. sklodowskiae</i> , <i>Richtersius coronifer</i> , <i>Xerobiotus pseudohufelandi</i>
Uganda	<i>Echiniscus arctomys</i> , <i>Pseudechiniscus pseudoconifer</i> , <i>P. suillus</i> , <i>Milnesium tardigradum</i> , <i>Diphascon alpinum</i> , <i>Hypsibius arcticus</i> , <i>Ramazzottius oberhaeuseri</i> , <i>Isohypsibius nodosus</i> , <i>Thulinus ruffoi</i> , <i>Macrobiotus hufelandi</i> , <i>M. kurasi</i> , <i>Mesobiotus harmsworthi</i> , <i>Minibiotus crassidens</i> , <i>M. hufelandioides</i> , <i>Paramacrobiotus richtersi</i> , <i>Dactylobiotus luci</i> , <i>Murrayon pullari</i>
Uganda/Kenya	<i>Echiniscus rugospinosus</i>
Zimbabwe	<i>Milnesium tardigradum</i> , <i>Astatumen trinacriae</i> , <i>Apodibius nuntius</i> , <i>Isohypsibius schaudinni</i> , <i>Paramacrobiotus richtersi</i>

To conclude, we have catalogued and commented on 170 tardigrade taxa from 26 countries of Africa, the second largest continent, at 35+ million km², but one of the least explored regions in terms of tardigrade literature

(Figure 2). Although tardigrades have no economic importance, and are of little interest to most African states, there is significant potential to expand the regional tardigrade data with a significant portion (perhaps even the majority) of the fauna currently undiscovered.

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