



Catalogue of families and their type genera in the mite suborder Uropodina (Acari: Mesostigmata)

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Abstract

This paper reviews 47 names that have been used at the levels of Family, Subfamily and Tribe, for mites in the suborder Uropodina. Complete bibliographic references are provided for all of these names and the names of their type genera. The spelling and authorship of taxon names is corrected where necessary. Fifteen of these family-group names are unavailable, because they do not satisfy the requirements of the *International Code of Zoological Nomenclature*. However, some of these names represent taxonomic concepts that may be useful in future revisions of the group.

Key words: Nomenclature, *Africola*, *Calotrachytes*, *Iphidinychus*, *Yedinychus*

Introduction

I recently published a catalogue of genus-group names in the mite Suborder Uropodina (Halliday, 2015). In that work I suggested a series of further steps that would be required for development of a stable classification of the group: (1) taxonomic research to determine which of the 300 genus-group names are synonyms of each other; (2) preparation of a new taxonomic concept for every valid genus; (3) preparation of a catalogue of all published family-group names; (4) determination of the type genus for all these family-group taxa; (5) determination of which of those family-group names are available in a nomenclatural sense; (6) taxonomic research to determine which of these family-group names are synonyms of each other; (7) preparation of a new key to families, so that every species and genus can be placed in the appropriate family. In this work I attempt steps (3), (4) and (5) in that program.

This paper does not contain a revised classification of the Uropodina, and it does not contain any tools for identification. Instead, my objective is to facilitate research on the systematics of the Uropodina, by clarifying the family-group names that will be available for use in a future revision.

Historical review

The mite group known as the Uropodina has had a very unstable history. Even its taxonomic rank is still not settled. In recent literature the Uropodina has been considered as a Cohort, Infraorder, and Suborder; this is a symptom of the instability of the higher classification of the mites in general. I here treat the Uropodina as a suborder. The use of Cohort at this level is inappropriate, because the term Cohort is used for taxa at a much higher level in the rest of the Animal Kingdom.

The name Uropodina was first used at the family-group level by Kramer (1881), who used the term Uropodina at a level between genus and family. That name is now used for the family Uropodidae Kramer, 1881. The first attempt to produce a family-level classification within the Uropodina was by Berlese (1917), and many of his taxonomic concepts remain valid today. Berlese placed all the Uropodina in the family Uropodidae, which he divided into nine tribes. Seven of those tribes were given new names. Sellnick (1926) added three new tribes, Vitzthum (1929) promoted Berlese's tribes to the family level, and Vitzthum (1931) incorporated Sellnick's tribes

to increase the number of families to ten. Vitzthum (1942) reviewed the family and genus classification and included nine families in his Cohort Uropodina, which did not include the Thinozerconina and Trachytina. Trägårdh (1944) recognised nine families of Uropodina, four of which were new, but did not include the taxa described by Sellnick (1926). Radford (1950) used the classification proposed by Vitzthum (1942). Baker & Wharton (1952) then provided a comprehensive review of the Acari, including 14 families of Uropodina, three families of Trachytina, and one of Diarthrophallina.

The systematics of the Uropodina then entered a dramatic new phase, with the arrival of Werner Hirschmann and his school, beginning in 1957. In the first of a long series of papers on Uropodina in *Acarologie, Schriftenreihe für Vergleichende Milbenkunde*, Hirschmann & Zirngiebl-Nicol (1961) presented a historical review of the Uropodina at the genus level, but did not introduce any new family-group taxa. Hirschmann & Zirngiebl-Nicol (1962) continued that process, and included the names "Oplitinae nova subfamilia" and "Trichouropodini nov. Tribus" in their classification of the family Uropodidae, without accompanying descriptions. These names are therefore not available in the nomenclatural sense, because they do not satisfy Article 13.1 of the *International Code of Zoological Nomenclature* (ICZN). Hirschmann & Zirngiebl-Nicol (1964) summarised the classification of the family Uropodidae, provided keys to subfamilies, tribes, and genera, and described several new subfamilies and tribes. Their revised classification reduced the number of valid genera from 105 to 28.

Hirschmann & Huţu (1974) attempted the first world-wide inventory of the Uropodina at the species level, with species arranged into genera, tribes and subfamilies. It included 787 species, all placed in the family Uropodidae. That inventory was updated in a supplement by Wiśniewski (1978). Nicol (1979) then compared the previous genus and family classifications of the Uropodina as used by Berlese (1917), Vitzthum (1942), Baker & Wharton (1952) and Hirschmann & Zirngiebl-Nicol (1961). That was followed by a new world-wide inventory of 1200 species of Uropodina, once again all placed in the family Uropodidae (Hirschmann, 1979a).

Hirschmann & Huţu (1974) recognised three phases in the development of Uropodina systematics – the early phase, before 1900, the adult systematics phase, from 1900 to 1960, in which the classification was based mostly on the description of adults, and the *Gangsystematik* phase, beginning in 1960, in which the classification was based on information from all stages of the life cycle. Hirschmann (1959, 1963a, 1963b) introduced the new taxonomic method called *Gangsystematik*, which may be translated as developmental systematics, or ontogenetic systematics. Hirschmann (1973c) summarised the principles of this method, and asserted that a robust classification must be based on characters that can be recognised at all stages of the life cycle. The result of that approach was a very heavy dependence on the gnathosoma as a source of diagnostic characters for subfamilies and tribes. Hirschmann & Zirngiebl-Nicol (1969a) reviewed the taxonomic history of the Uropodina and explained how the principles of *Gangsystematik* should be applied to their classification. In Hirschmann & Zirngiebl-Nicol (1969b) they detailed how morphological structures of the idiosoma, legs, and gnathosoma should be interpreted for taxonomic use, and suggested a standard system of anatomical nomenclature.

In *Gangsystematik*, a *Ganggattung* ("developmental genus") is a genus based on a complete series of developmental instars. A *Teilganggattung* ("partial developmental genus") is a genus based on an incomplete series of instars. Its taxonomic definition is therefore less complete, but it occupies the same rank as a *Ganggattung*. Hirschmann (1979b) compared the *Gangsystematik* classification of the Uropodina with a more conventional system, which he called a *Stadiensystematik* classification. His *Stadiensystematik* classification included 193 genera arranged in 36 families. Fifteen of these families had new names, and represented taxa that had previously been treated as *Ganggattungen* or *Teilganggattungen*.

For example, *Macrodinychus* Berlese, 1917 was listed as a *Teilganggattung* and not a *Ganggattung* in Hirschmann (1979b), because at that time it was based only on the larva and the male and female adults, and the nymphs were unknown. The taxonomic concept of the *Teilganggattung* called *Macrodinychus* may be deduced from bibliographic references to earlier descriptions of the genus (Hirschmann, 1967, page 16; 1975b, page 35). In those earlier works, *Macrodinychus* is treated as a genus in the Tribe Trichouropodini, Subfamily Uropodinae, and Family Uropodidae. In Hirschmann (1975b), the genus *Macrodinychus* was split into two subgenera, and in Hirschmann (1975c), one of these subgenera was further split into three species groups. In Hirschmann (1979b), these species groups were promoted to the genus level (*Stadiengattungen*). The *Teilganggattung* called *Macrodinychus* still had the authorship Berlese, 1917. This means that in a conventional hierarchy, *Macrodinychus* Berlese, 1917 *sensu lato* would be a taxon at an undefined rank between genus and family, but not a family-group taxon. The *Teilganggattung* called *Macrodinychus* on page 65 of Hirschmann (1979b) became the *Stadienfamilie*

Macrodivychidae Hirschmann, 1979 on page 70. The introduction of the suffix -idae formalises the transition of this taxon to the conventional family level for the first time, and is accompanied by the change in authorship from Berlese, 1917 to Hirschmann, 1979. The family Macrodivychidae as such is not described or defined, and therefore fails ICZN Article 13.1.1.

It could be argued that the definition of Macrodivychidae is the same as that of the *Ganggattung* called *Macrodivychus*, since their taxonomic content is the same, and Hirschmann (1979b, page 57) said that *Ganggattungen* should be regarded as taxa at the family level. However, the name Macrodivychidae is not accompanied by any explicit statement to that effect, or any bibliographic reference to any descriptive or diagnostic information. It therefore fails ICZN Article 13.1.2. The family name is not made available simply by its formation from an available genus name (ICZN Articles 13.6.1 and 12.2.4). The name Macrodivychidae is therefore a *nomen nudum*, and the same is true for the other 14 new family names on pages 69 and 70 of Hirschmann (1979b) (those with stated authorship Hirschmann 1979).

The new family names in Hirschmann (1979b) occur in a fold-out Table headed "Stadienfamilien und Stadiengattungen der Atrichopygidiina Hirschmann 1979" and "- 69/70 -", meaning pages 69 and 70. Some authors have interpreted this Table as part of the surrounding paper by Wiśniewski (1979, pages 68, 71–74). However, it is more likely that the Table is intended to be a continuation of Hirschmann (1979b), with pages 69 and 70 to follow his page 68. On page 57 Hirschmann (1979b) refers to the data on pages 69 and 70 as part of the same paper. The Wiśniewski (1979) paper is simply a list of Uropodina collected in Poland, and uses a *Gangsystematik* classification, rather than the conventional classification introduced by Hirschmann (1979b).

In the same volume of *Acarologie*, Hirschmann (1979c) compiled a supplementary list of the species of Uropodina recorded from each biogeographic region and each individual country, to add to the lists of Hirschmann & Huťu (1974) and Wiśniewski (1978), using a classification based on *Gangsystematik* methods.

Evans (1972) and Ainscough (1979) pointed out some weaknesses in the *Gangsystematik* approach, especially its tendency to create unnatural groupings of genera. Its heavy dependence on the gnathosoma as a source of taxonomic information was perceived as problematic, because feeding structures are probably subject to a high level of homoplastic modification.

Karg (1989) used a conservative classification of the Uropodina, using nine families, and Mařán (2001) used a simplified classification that did not include the names created by Hirschmann (1979b). Lindquist *et al.* (2009) used a concept of the Uropodina that included 13 families. Their classification was based mainly on that of Karg (1989), and was accompanied by the most modern available key to families. In contrast, Beaulieu *et al.* (2011) listed 35 families, resurrecting many of the family names established by Hirschmann (1979b).

Hirschmann (1993), Wiśniewski & Hirschmann (1993), and Wiśniewski (1993a, 1993b, 1993c) provided a comprehensive catalogue of the Uropodina at the species level, but did not use any family-group names, and used only 41 of the more than 250 available genus names. This means that many genera, and therefore families, were implicitly relegated into subjective synonymy.

These publications over the last 30 years reveal a wide range of opinions about the number of families that should be used in a classification of the Uropodina, from six to more than 40. This leads to the unfortunate situation in which different authors place the same genus in different families. Some authors have avoided this problem by not placing genera into families at all. Lindquist *et al.* (2009) foreshadowed an increase in the number of families following study of the diverse fauna of previously unexplored areas, especially the Southern Hemisphere. However, that process of discovery may actually require the reconstruction of a classification using family names that already exist, whether or not they are available in a nomenclatural sense. This paper provides details of the family names that will be available for use, when a new classification is eventually developed.

Methods and conventions

During my previous search for genus-group names, I also compiled a list of family-group names in the Uropodina, from the same sources. I use the term family-group here in the nomenclatural sense, to include the categories Superfamily, Family, Subfamily, Tribe, and Subtribe. According to the Principle of Coordination, the description of a taxon at any of those levels automatically implies the description of taxa at all other levels, with the same type genus (ICZN, Article 36.1). For example, Rotundabaloghiinae Kontschán, 2010 and Depressorotundinae

Kontschán, 2010 were both described as subfamilies. This automatically implied the simultaneous description of Rotundabaloghiidae and Depressorotundidae. For the purpose of this catalogue I list all these names at the family level, without implying any statement about their eventual taxonomic status.

For some family-group names, there is some question about whether the name was correctly established according to the ICZN, or whether it is a *nomen nudum*. Apart from the special case of replacement names, new names published after 1930 must "be accompanied by a description or definition that states in words characters that are purported to differentiate the taxon" (Article 13.1.1), or must "be accompanied by a bibliographic reference to such a published statement" (Article 31.1.2). As explained above, many of the new family names in Hirschmann (1979b) fail this test. In these cases I searched the literature and the internet for publications after 1979 that used the name of the family or its type genus. I present the results of that search at laborious length in each case, to determine whether any later author made the family name available. Many of Hirschmann's (1979b) family names are included in internet lists and catalogues, but these do not make the names available in a nomenclatural sense, and they are not considered further.

In some cases there are two alternative spellings of a family name, such as Polyaspidae and Polyaspididae. In these cases I have used the spelling that has a clear majority of recent usage, even if it is not strictly correct grammatically.

The information presented for each name is the family name with its author and date in bold face; then the name in its original form, with its author, date of publication, and the number of the page on which the description begins; the name of the type genus, with its author, date, and page number; a statement of how the type genus of the family was designated; and a section headed *Notes*, where any unusual or complicated circumstances are explained. Family names are listed in alphabetical order, and are not sorted into superfamilies or other higher taxa.

After 1999, the establishment of a new family must include the designation of a type genus (ICZN Article 16.2). Some families described before 1999 did not have a formally designated type genus when they were first described. In these cases the type genus may be inferred from the name of the family (ICZN, Articles 11.7.1.1 and 61.1.2).

Results

Baloghjkaszabiidae Hirschmann, 1979

Baloghjkaszabiidae Hirschmann, 1979b: 69 (*nomen nudum*).

Type genus *Baloghjkaszabia* Hirschmann, 1973a: 103, by monotypy.

Notes. This family name was first used by Hirschmann (1979b) with one included genus, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Teilgangsgattung* called *Baloghjkaszabia* in Hirschmann (1979b, page 60). Ainscough (1981), Hirschmann (1993), Wiśniewski & Hirschmann (1993), Wiśniewski (1993a, 1993b, 1993c) and Kontschán (2010a) used the genus name, but did not indicate its family placement. Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Brasiluropodidae Hirschmann, 1979

Brasiluropodidae Hirschmann, 1979b: 69 (*nomen nudum*).

Type genus *Brasiluropoda* Hirschmann, 1979b: 66, by inference from the family name.

Notes. This family name was first used by Hirschmann (1979b) with five included genera, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Teilgangsgattung* called *Brasiluropoda* in Hirschmann (1979b, page 65). Hirschmann (1979c) placed *Brasiluropoda* in the Subfamily Uropodinae and Tribe Trichouropodini, implying the synonymy of Brasiluropodidae with Trichouropodidae. Vázquez & Klompen (2001) used the family name Brasiluropodidae but did not provide a description or any other

taxonomic information. Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. Kontschán (2010b) placed *Brasiluropoda* in the Brasiluropodidae, but did not provide any descriptive information about the family. Hiramatsu (1981b) placed *Brasiluropoda* in the subfamily Uropodinae and Tribe Trichouropodini. Hirschmann (1993), Wiśniewski & Hirschmann (1993), and Wiśniewski (1993a, 1993b, 1993c) and Kontschán (2009a, 2010c) used the genus name, but did not indicate its family placement. I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Castriidinychidae Hirschmann, 1979

Castriidinychidae Hirschmann, 1979b: 69 (*nomen nudum*).

Type genus *Castriidinychus* Hirschmann, 1973b: 158, by inference from the family name.

Notes. This family name was first used by Hirschmann (1979b) with four included genera, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Ganggattung* called *Castriidinychus* in Hirschmann (1979b, page 60). Hirschmann (1979c) placed *Castriidinychus* in the Subfamily Uropodinae and Tribe Dinychini, implying the synonymy of Castriidinychidae with Dinychidae. Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. Hirschmann (1984b), Huřu (2000), and Kontschán (2013) used the genus name but not the family name. Dylewska *et al.* (2010) discussed the use of the family name, but placed *Castriidinychus* in the Uropodidae. Hirschmann (1993), Wiśniewski & Hirschmann (1993), and Wiśniewski (1993a, 1993b, 1993c) used the genus name, but did not indicate its family placement. I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Cillibidae Trägårdh, 1944

Cillibidae Trägårdh, 1944: 184.

Type genus *Cilliba* von Heyden, 1826: 613, by original designation.

Circocyllibidae Sellnick, 1926

Circocyllibanini Sellnick, 1926: 30 (incorrect original spelling)

Type genus *Circocylliba* Sellnick, 1926: 40, by inference from the family name.

Notes. Szymkowiak *et al.* (2007) used the spelling Circocyllibidae, which is grammatically correct (Steyskal, 1970). The spelling Circocyllibanidae has had very limited use, so the emended spelling Circocyllibidae should be used.

Clausiadinychidae Hirschmann, 1979

Clausiadinychidae Hirschmann, 1979b: 69 (*nomen nudum*).

Type species *Clausiadinychus* Sellnick, 1930: 168, by monotypy.

Notes. This family name was first used by Hirschmann (1979b) with one included genus, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Ganggattung* called *Clausiadinychus* in Hirschmann (1979b, page 60). Farrier & Hennessey (1993), Vázquez & Klompen (2007) used the family name but did not provide a description or any other taxonomic information. Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. Huřu (1991), Hirschmann (1993), Wiśniewski & Hirschmann (1993), Wiśniewski (1993a, 1993b, 1993c) and Kontschán (2007) used the genus name, but did not indicate its family placement. I have been

unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Coxequesomidae Sellnick, 1926

Coxequesomini Sellnick, 1926: 30.

Type genus *Coxequesoma* Sellnick, 1926: 47, by inference from the family name.

Cyllibanidae Berlese, 1913

Cyllibanini Berlese, 1913: 13 (unavailable name).

Type genus "*Cyllibano*" von Heyden, 1826: 613, by inference from the family name.

Notes. Cyllibanidae is not an available name because it is not based on an available genus name (ICZN Article 11.7.1.1). The name *Cyllibano* attributed to von Heyden (1826) is a mis-reading of the words "*Cilliba* nob." (Halliday, 2015).

Cyllibulidae Hirschmann, 1979

Cyllibulidae Hirschmann, 1979b: 69 (*nomen nudum*).

Type genus *Cyllibula* Berlese, 1916a: 23, by inference from the family name.

Notes. This family name was first used by Hirschmann (1979b) with seven included genera, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Ganggattung* called *Cyllibula* in Hirschmann (1979b, page 63). Farrier & Hennessey (1993), Vázquez & Klompen (2001, 2007), Kontschán (2010b), Kontschán & Starý (2012) used the family name but did not provide a description or any other taxonomic information. Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. Błoszyk & Athias-Binche (1986), Wiśniewski & Hirschmann (1991, 1993), Hirschmann (1993), Wiśniewski (1993a, 1993b, 1993c), and Kontschán (2005, 2007, 2009a) used the genus name, but did not indicate its family placement. Hiramatsu (1980a) placed *Cyllibula* in the Subfamily Uropodinae and Tribe Dinychini. Vázquez *et al.* (2007) incorrectly gave the authorship of the family name as Hirschmann & Wiśniewski (1979). I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Depressorotundidae Kontschán, 2010

Depressorotundinae Kontschán, 2010d: 102.

Type genus *Depressorotunda* Kontschán, 2010e: 1462, by inference from the family name.

Notes. Kontschán (2010d) described Depressorotundinae as a new subfamily, but did not explicitly designate a type genus. However, the citation of the genus *Depressorotunda* in Kontschán (2010d) is enough to make the family name available (ICZN Article 16.2). The date of publication of *Depressorotunda* by Kontschán (2010e) was June 2010, and the date of publication of the family name by Kontschán (2010d) is deemed to be 31 December 2010 (ICZN Article 21.3.2).

Deraiphoridae Trägårdh, 1952

Deraiphoridae Trägårdh, 1952: 73.

Type species *Deraiphorus* Canestrini, 1897: 471, by original designation.

Diarthrophallidae Trägårdh, 1946

Diarthrophallidae Trägårdh, 1946b: 35.

Type species *Diarthrophallus* Trägårdh, 1946a: 370, by original designation.

Dinychidae Berlese, 1916

Dinychinis Berlese, 1916b: 135.

Type species *Dinychus* Kramer, 1886: 255.

Notes. Most authors have attributed the name Dinychidae to Vitzthum, 1931. However, Berlese (1916b) refers to the placement of his new genus *Metadinychus* as "Ex Uropodidis, Dinychinis". Berlese's meaning here is ambiguous, but this could be interpreted to mean Family Uropodidae, Subfamily Dinychinae or Tribe Dinychini. Where Berlese describes other new genera in the same paper, the genus name is sometimes followed by the name of its family, for example "*Coleoscurus* Berl. n. gen., Ex. fam. Bdellidae", but his typographical style is not consistent. Farrier & Hennessey (1993) interpreted the word "Dinychinis" as a family-group name, and I have followed that usage.

Discourellidae Baker & Wharton, 1952

Discourellidae Baker & Wharton, 1952: 110.

Protouropodidae Trägårdh, 1941: 356 (unavailable name).

Type genus *Discourella* Berlese, 1910: 378, by original designation.

Notes. Protouropodidae Trägårdh, 1941 is not an available family name because it is not based on the name of a valid genus (ICZN, Article 11.7.1.1).

Dithinozerconidae Krantz, 1978

Dithinozerconidae Krantz, 1978: 140.

Type genus *Dithinozercon* Berlese, 1916c: 295, by inference from the family name.

Notes. This family name is often wrongly attributed to Ainscough (1979). Krantz (1978) first made the name available by including it in a key to families and using the name of the type genus.

Eutrachytidae Trägårdh, 1944

Eutrachytidae Trägårdh, 1944: 184.

Type species *Eutrachytes* Berlese, 1914: 132, by original designation.

Hutufeideriidae Hirschmann, 1979

Hutufeideriidae Hirschmann, 1979b: 69 (*nomen nudum*).

Type genus *Hutufeideria* Hirschmann & Hiramatsu, 1977: 69, by monotypy.

Notes. This family name was first used by Hirschmann (1979b) with one included genus, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Teilgangsgattung* called *Hutufeideria* in Hirschmann (1979b, page 62). Beaulieu *et al.* (2011) used the family name and attributed it to Hirschmann (1979b) but did not provide a description or any other taxonomic information. Hiramatsu (1980b,

1981a, 1983) and Kontschán (2010f) placed *Hutufeideria* in the family Uropodidae. Hirschmann (1993), Wiśniewski & Hirschmann (1993), Wiśniewski (1993a, 1993b, 1993c) and Kontschán (2011a) used the genus name but not the family name. I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Kaszabjbaloghiidae Hirschmann, 1979

Kaszabjbaloghiidae Hirschmann, 1979b: 69 (*nomen nudum*).

Type genus *Kaszabjbaloghia* Hirschmann, 1973a: 103, by monotypy.

Notes. This family name was first used by Hirschmann (1979b) with one included genus, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Teilgangsgattung* called *Kaszabjbaloghia* in Hirschmann (1979b, page 60). Kontschán (2010a, 2010f) placed *Kaszabjbaloghia* in the family Uropodidae. Hirschmann (1993), Wiśniewski & Hirschmann (1993), Wiśniewski (1993a, 1993b, 1993c) and Kontschán (2011a) used the genus name but not the family name. Vázquez & Klompen (2007) used the family name but did not provide a description or any other taxonomic information. Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Macrodinychidae Hirschmann, 1979

Macrodinychidae Hirschmann, 1979b: 70 (*nomen nudum*).

Type genus *Macrodinychus* Berlese, 1917: 12, by inference from the family name.

Notes. This family name was first used by Hirschmann (1979b) with four included genera, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Teilgangsgattung* called *Macrodinychus* in Hirschmann (1979b, page 65). Farrier & Hennessey (1993), Vázquez & Klompen (2007) and Kontschán (2008a) used the family name but did not provide a description or any other taxonomic information. Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. The genus name *Macrodinychus* is in widespread use, and the genus has been placed in the Uropodidae (Gonzalez *et al.*, 2004), or Uropodinae (Hiramatsu, 1980c), or left without a family placement. Hirschmann (1993), Wiśniewski & Hirschmann (1993), and Wiśniewski (1993a, 1993b, 1993c) used the genus name, but did not indicate its family placement. Kontschán (2011b) reviewed the history of the family and considered it to include only the genus *Macrodinychus*, with four subgenera. He provided a diagnosis of the family, but attributed the name to Hirschmann (1979b), and did not state that it was a new name, so he did not make the name available (ICZN Article 16.1). Kontschán & Hajizadeh (2013) incorrectly referred to Macrodinychidae Hirschmann, 1975. I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Metagynellidae Camin, 1953

Metagynellidae Camin, 1953: 392.

Type genus *Metagynella* Berlese in Trouessart & Berlese, 1919: 4, by original designation.

Metagynuridae Balogh, 1943

Metagynuridae Balogh, 1943: 35.

Type genus *Metagynura* Balogh, 1943: 33, by monotypy.

Microgyniidae Trägårdh, 1942

Microgyniidae Trägårdh, 1942b: 133.

Type genus *Microgynium* Trägårdh, 1942b: 122, by inference from the family name.

Nenteriidae Hirschmann, 1979

Nenteriidae Hirschmann, 1979b: 70 (*nomen nudum*).

Type genus *Nenteria* Oudemans, 1915: 185, by inference from the family name.

Notes. This family name was first used by Hirschmann (1979b) with seven included genera, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Ganggattung* called *Nenteria* in Hirschmann (1979b, page 65). In Volume 32 of *Acarologie*, Hirschmann published eight papers each describing a new genus in the family Nenteriidae. For example, in the first of those papers Hirschmann (1985a) described *Dobrogensisnenteria* Hirschmann, 1985. None of those papers contained any descriptive information about the family. Farrier & Hennessey (1993), Vázquez & Klompen (2007, as Nentereiidae), Kontschán (2010b, 2012a, and elsewhere), also used the family name but did not provide a description or any other taxonomic information about the family. Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. Hirschmann (1993), Wiśniewski & Hirschmann (1988, 1993), Wiśniewski (1993a, 1993b, 1993c), Kontschán (2006) and many other authors used the genus name but not the family name. As well as Nenteriidae, the genus *Nenteria* has been placed in the Trematuridae (Karg, 1989; Bal & Özkan, 2000; Maśán, 2001), Uropodidae (El-Banhawy *et al.*, 1997), and Uropodinae: Trichouropodini (Hirschmann, 1985b and others). I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Nothogynidae Walter & Krantz, 1999

Nothogynidae Walter & Krantz, 1999: 69.

Type genus *Nothogynus* Walter & Krantz, 1999: 69, by original designation.

Oplitidae Hirschmann & Zirngiebl-Nicol, 1964

Oplitinae Hirschmann & Zirngiebl-Nicol, 1962: 79 (*nomen nudum*).

Oplitinae Hirschmann & Zirngiebl-Nicol, 1964: 4.

Type genus *Oplitis* Berlese, 1884: 9, by original designation.

Notes. Some authors have incorrectly attributed the authorship of the family name to Johnston (1968).

Phaulodinychidae Berlese, 1917

Phaulodinychini Berlese, 1917: 11.

Type genus *Phaulodinychus* Berlese, 1904a: 269, by inference from the family name.

Phymatodiscidae Hirschmann, 1979

Phymatodiscidae Hirschmann, 1979b: 70 (*nomen nudum*).

Type genus *Phymatodiscus* Berlese, 1917: 12, by monotypy.

Notes. This family name was first used by Hirschmann (1979b) with one included genus, but without any

description or diagnosis. At that time the family had the same taxonomic content as the *Teilganggattung* called *Phymatodiscus* in Hirschmann (1979b, page 64). Hiramatsu (1985) and Kotschán & Starý (2011, 2012) placed *Phymatodiscus* in the family Uropodidae, and Vázquez & Klompen (2001), and Vázquez *et al.* (2007) placed it in the Trachyuropodidae. Hirschmann (1993), Wiśniewski & Hirschmann (1993), and Wiśniewski (1993a, 1993b, 1993c), and Vázquez & Klompen (2007) used the genus name, but did not indicate its family placement. Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Planodiscidae Sellnick, 1926

Planodiscini Sellnick, 1926: 30.

Type genus *Planodiscus* Sellnick, 1926: 44, by inference from the family name.

Polyaspididae Berlese, 1913

Polyaspidini Berlese, 1913: 13.

Type genus *Polyaspis* Berlese, 1881: 71, by inference from the family name.

Notes. The family name has been spelled as Polyaspidae by some authors, but that is grammatically incorrect (Steyskal, 1970). The correct name Polyaspididae is in widespread use and should be accepted.

Polyaspinidae Trägårdh, 1941

Polyaspinidae Trägårdh, 1941: 356.

Type species *Polyaspinus* Berlese, 1916c: by original designation.

Prodinychidae Berlese, 1917

Prodinychini Berlese, 1917: 9.

Type genus *Prodinychus* Berlese, 1917: 10, by inference from the family name.

Protodinychidae Evans, 1957

Protodinychidae Evans, 1957: 239.

Type genus *Protodinychus* Evans, 1957: 239, by monotypy.

Rotundabaloghiidae Kotschán, 2010

Rotundabaloghiidae Hirschmann, 1979b: 69 (*nomen nudum*).

Rotundabaloghiinae Kotschán, 2010d: 21.

Type genus *Rotundabaloghia* Hirschmann, 1975a: 23, by inference from the family name.

Notes. This family name was first used by Hirschmann (1979b) with two included genera, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Teilganggattung* called *Rotundabaloghia* in Hirschmann (1979b, page 61). Hirschmann (1979c, 1984a) placed *Rotundabaloghia* in the Subfamily Uropodinae and Tribe Dinychini, implying the synonymy of Rotundabaloghiidae with Dinychidae. Kotschán (2008c, 2009b, 2009c) placed *Rotundabaloghia* in the Uropodidae. Kotschán (2010d) used the name

"Rotundabalogiinae n. subfamily", but did not explicitly designate a type genus. After 1999, the type genus of a new family must be cited (ICZN Article 16.2), and the citation of the genus *Rotundabaloghia* by Kontschán (2010d) is enough to make the family name available (apparently by accident).

Tetrasejaspidae Hirschmann, 1979

Tetrasejaspidae Hirschmann, 1979b: 69 (*nomen nudum*).

Type genus *Tetrasejaspis* Sellnick, 1941: 145, by monotypy.

Notes. This family name was first used by Hirschmann (1979b) with one included genus, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Ganggattung* called *Tetrasejaspis* in Hirschmann (1979b, page 64). Vázquez & Klompen (2007) and Kontschán (2012a) used the family name but did not provide a description or any other taxonomic information. Kontschán (2008d) provided a morphological description of the family and its type genus. However, he attributed the family name to Hirschmann (1979b), and did not state that it was a new name. His actions therefore do not make the family name available (ICZN Article 16.1). Beaulieu *et al.* (2011) also used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. Huťu (1991), Hirschmann (1993), Wiśniewski & Hirschmann (1993), Wiśniewski (1993a, 1993b, 1993c) and Kontschán (2007) used the genus name, but did not indicate its family placement. I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Thinozerconidae Halbert, 1915

Thinozerconidae Halbert, 1915: 80.

Type genus *Thinozercon* Halbert, 1915: 82, by monotypy.

Trachytidae Trägårdh, 1938

Trachytidae Trägårdh, 1938: 156.

Type genus *Trachytes* Michael, 1894: 297, by monotypy.

Trachyuropodidae Berlese, 1917

Trachyuropodini Berlese, 1917: 9.

Type genus *Trachyuropoda* Berlese, 1888: 209, by inference from the family name.

Trematurellidae Trägårdh, 1944

Trematurellidae Trägårdh, 1944: 184.

Type genus *Trematurella* Trägårdh, 1942a: 111, by original designation.

Trematuridae Berlese, 1917

Trematurini Berlese, 1917: 9.

Type genus *Trematura* Berlese, 1917: 12, by monotypy.

Trichocyllibidae Hirschmann, 1979

Trichocyllibidae Hirschmann, 1979b: 69 (*nomen nudum*).

Type genus *Trichocylliba* Berlese, 1904b: 329, by inference from the family name.

Notes. This family name was first used by Hirschmann (1979b) with three included genera, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Adultengattung* called *Trichocylliba* in Hirschmann (1979b, page 63). Hirschmann (1979c) placed *Trichocylliba* in the Subfamily Uropodinae and Tribe Dinychini, implying the synonymy of Trichocyllibidae with Dinychidae. Wiśniewski & Hirschmann (1983) and Hirschmann (1992) also placed *Trichocylliba* in Uropodinae: Dinychini, but Mašán (2001) placed it in the Urodinychidae. Farrier & Hennessey (1993) and Kontschán (2012a) used the family name Trichocyllibidae but did not provide a description or any other taxonomic information. Vázquez *et al.* (2007) incorrectly gave the authorship of the family name as Hirschmann & Wiśniewski (1979). Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. Elzinga (1982, 1995), Hirschmann (1993), Wiśniewski & Hirschmann (1993), Wiśniewski (1993a, 1993b, 1993c), Mašán (1999), Kontschán (2004, 2010c) and Vázquez & Klompen (2007) used the genus name, but did not indicate its family placement. I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Farrier & Hennessey (1993) and Vázquez & Klompen (2001) spelled the family name as Thrichocyllibidae. This confusion about spelling dates from the original description of the type genus, where Berlese (1904b) spelled it as both *Trichocylliba* and *Thrichocylliba*. Elzinga (1982) pointed out that Berlese (1917) used the spelling *Trichocylliba*, and described this action as an emendation. Farrier & Hennessey (1993) argued that *Trichocylliba*, as used by Berlese (1917) and many subsequent authors, is an incorrect subsequent spelling. However, I have previously argued that *Trichocylliba* should be considered as the correct spelling (Halliday, 2015). The correct spelling of the family name will be Trichocyllibidae, when the family is correctly described.

Trichouropodellidae Hirschmann, 1979

Trichouropodellidae Hirschmann, 1979b: 70 (*nomen nudum*).

Type genus *Trichouropodella* Hirschmann & Zirngiebl-Nicol, 1972: 15.

Notes. This family name was first used by Hirschmann (1979b) with one included genus, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Teilgangsgattung* called *Trichouropodella* in Hirschmann (1979b, page 65). Hirschmann (1983, 1993), Huťu (1987), Wiśniewski & Hirschmann (1993), Wiśniewski (1993a, 1993b, 1993c) and Kontschán (2010c, 2014) used the genus name, but did not indicate its family placement. Farrier & Hennessey (1993) and Vázquez & Klompen (2001, 2007) used the family name but did not provide a description or any other taxonomic information. Vázquez *et al.* (2007) incorrectly gave the authorship of the family name as Hirschmann & Wiśniewski (1979). Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Trichouropodidae Hirschmann & Zirngiebl-Nicol, 1964

Trichouropodini Hirschmann & Zirngiebl-Nicol, 1962: 79 (*nomen nudum*).

Trichouropodini Hirschmann & Zirngiebl-Nicol, 1964: 4.

Type genus *Trichouropoda* Berlese, 1916b: 142, by original designation.

Trigonuropodidae Hirschmann, 1979

Trigonuropodidae Hirschmann, 1979b: 69 (*nomen nudum*).

Type genus *Trigonuropoda* Trägårdh, 1952: 77, by inference from the family name.

Notes. This family name was first used by Hirschmann (1979b) with seven included genera, but without any description or diagnosis. At that time the family had the same taxonomic content as the *Ganggattung* called *Trigonuropoda* in Hirschmann (1979b, page 61). Hirschmann (1979c) placed *Trigonuropoda* in the Subfamily Uropodinae and Tribe Dinychini, implying the synonymy of Trigonuropodidae with Dinychidae. Farrier & Hennessey (1993), Vázquez & Klompen (2001, 2007), Kotschán (2008b, 2009a, 2012b), and Kotschán & Starý (2013) used the family name but did not provide a description or any other taxonomic information. Vázquez *et al.* (2007) incorrectly gave the authorship of the family name as Hirschmann & Wiśniewski (1979). Beaulieu *et al.* (2011) used the family name but attributed the name to Hirschmann (1979b) and did not provide a description or any other taxonomic information. Apart from Trigonuropodidae, *Trigonuropoda* has also been placed in the Uropodidae (e.g. Halliday, 1996; Hiramatsu, 2001) and in Uropodinae: Dinychini (e.g. Hiramatsu, 1981c; Hirschmann, 1990). Hirschmann (1993), Wiśniewski & Hirschmann (1993), Wiśniewski (1993a, 1993b, 1993c) and Kotschán (2013 and elsewhere) used the genus name, but did not indicate its family placement. I have been unable to locate any description or diagnosis that would make the family name available, so it remains a *nomen nudum*.

Uroactiniidae Hirschmann & Zirngiebl-Nicol, 1964

Uroactiniinae Hirschmann & Zirngiebl-Nicol, 1964: 3.

Type genus *Uroactinia* Zirngiebl in Sellnick, 1958: 274, by original designation.

Notes. Hirschmann & Zirngiebl-Nicol (1964) wrongly referred to *Uroactinia* as a new genus. The family name has been incorrectly spelled as Uroactinidae (by Vázquez & Klompen, 2001) and Uroatinidae (by Vázquez & Klompen, 2007). Some authors have incorrectly attributed the authorship of the family name to Johnston (1968).

Urodiaspididae Trägårdh, 1944

Urodiaspidae Trägårdh, 1944: 185.

Type genus *Urodiaspis* Berlese, 1916a: 25, by original designation.

Notes. The family name has been spelled as Urodiaspidae by some authors, but that is grammatically incorrect (Steyskal, 1970). The correct name Urodiaspididae is in widespread use and should be accepted.

Urodinychidae Berlese, 1917

Urodinychini Berlese, 1917: 9.

Type genus *Urodinychus* Berlese, 1904a: 270, by inference from the family name.

Uropodidae Kramer, 1881

Uropodina Kramer, 1881: 641.

Type genus *Uropoda* Latreille, 1806, by inference from the family name.

Notes. Kramer (1881, page 641) referred to a taxon called Uropodina, which included the genera *Uropoda* de Geer and *Trachynotus* Kramer. On the following page he said that the Uropodina may be divided into two tribes, depending on the presence or absence of claws on leg I. This makes it clear that he was referring to Uropodina as a family-group taxon. He was mistaken about the authorship of the genus *Uropoda*.

Various authors have referred to taxa with names such as "Uropodidae Berlese, 1892", "Uropodidae Berlese, 1900", "Uropodidae Berlese, 1910", "Uropodini Berlese, 1917", "Uropodoidea Evans, 1957", or "Uropodinae Hirschmann & Zirngiebl-Nicol, 1962", but none of these is correct. According to the Principle of Coordination (ICZN Article 36.1), the author of all these names is Kramer (1881).

Discussion

The results of this survey are summarised in Table 1. The total number of family names is 47, of which 32 are available in a nomenclatural sense. Hirschmann (1979b) created 15 new family names, and 14 of those remain unavailable as *nomina nuda*. The single exception is Rotundabaloghiidae. This name was first used by Hirschmann (1979b) but was first made available by Kontschán (2010d), apparently by accident.

TABLE 1. Summary of available and unavailable family names in the Uropodina.

Available names	Unavailable names
Cillibidae Trägårdh, 1944	Baloghjkaszabiidae Hirschmann, 1979
Circocyllibidae Sellnick, 1926	Brasiluropodidae Hirschmann, 1979
Coxequesomidae Sellnick, 1926	Castriidinychidae Hirschmann, 1979
Depressorotundidae Kontschán, 2010	Clausiadinychidae Hirschmann, 1979
Deraiphoridae Trägårdh, 1952	Cyllibanidae Berlese, 1913
Diarthrophallidae Trägårdh, 1946	Cyllibulidae Hirschmann, 1979
Dinychidae Berlese, 1916	Hutufeideriidae Hirschmann, 1979
Discourellidae Baker & Wharton, 1952	Kaszabjbaloghiidae Hirschmann, 1979
Dithinozerconidae Krantz, 1978	Macrodinychidae Hirschmann, 1979
Eutrachytidae Trägårdh, 1944	Nenteriidae Hirschmann, 1979
Metagynellidae Camin, 1953	Phymatodiscidae Hirschmann, 1979
Metagynuridae Balogh, 1943	Tetrasejaspidae Hirschmann, 1979
Microgyniidae Trägårdh, 1942	Trichocyllibidae Hirschmann, 1979
Nothogynidae Walter & Krantz, 1999	Trichouropodellidae Hirschmann, 1979
Oplitidae Hirschmann & Zirngiebl-Nicol, 1964	Trigonuropodidae Hirschmann, 1979
Phaulodinychidae Berlese, 1917	
Planodiscidae Sellnick, 1926	
Polyaspididae Berlese, 1913	
Polyaspinidae Trägårdh, 1941	
Prodinychidae Berlese, 1917	
Protodinychidae Evans, 1957	
Rotundabaloghiidae Kontschán, 2010	
Thinozerconidae Halbert, 1915	
Trachytidae Trägårdh, 1938	
Trachyuropodidae Berlese, 1917	
Trematurellidae Trägårdh, 1944	
Trematuridae Berlese, 1917	
Trichouropodidae Hirschmann & Zirngiebl-Nicol, 1964	
Uroactiniidae Hirschmann & Zirngiebl-Nicol, 1964	
Urodiaspididae Trägårdh, 1944	
Urodinychidae Berlese, 1917	
Uropodidae Kramer, 1881	

Some of the unavailable names in Table 1 have been used in the literature, but the families they represent have never been defined. The taxonomic identity of these families can only be determined from their constituent genera, as listed by Hirschmann (1979b), with later additions if any. When a comprehensive revision of the Uropodina is attempted, it will be necessary to assign 280 genera to families and subfamilies. I have already pointed out that some of the existing family concepts will be taxonomically useful in that process, even if their names are

unavailable (Halliday, 2013). Some of the *nomina nuda* created by Hirschmann (1979b) for family-level taxa appear to be useful. However, the taxa they represent must still be formally described, preferably with the same names, and the names will then be ascribed to a new author and date.

The most complete list of families published previously is that of Beaulieu *et al.* (2011), which included 35 families. The discrepancy between their 35 and my 47 is caused by subjective synonymy at either the family or genus level, which must also be resolved.

Appendix

I take this opportunity to make some additions and corrections to my previous paper (Halliday, 2015).

***Africola* Koçak & Kemal, 2008**

Africola Koçak & Kemal, 2008: 2.

Notoporus Schuster & Summers, 1978: 309 (junior homonym).

Type species *Notoporus clypeolus* Schuster & Summers, 1978: 309, by original designation.

Notes. *Notoporus* Schuster & Summers, 1978 (Acari) is a junior homonym of *Notoporus* Yamaguti, 1938 (Trematoda), and was replaced by *Africola* Koçak & Kemal, 2008.

***Calotrachytes* Berlese, 1916**

Polyaspis (*Calotrachytes*) Berlese, 1916a: 28.

Type species *Trachynotus sclerophyllus* Michael, 1908: 145, by original designation.

Notes. Vitzthum (1942: 790) stated that the type species of *Calotrachytes* is *Trachynotus fimbriatus* Michael, 1908, but in doing so he made two mistakes. Berlese (1916a) designated *Trachynotus sclerophyllus* as the type species of *Calotrachytes*, and the species Vitzthum referred to as *Trachynotus fimbriatus* should have been *Trachynotus fimbriatipes*.

***Iphidinychus* Berlese, 1913**

Epicroseius (*Iphidinychus*) Berlese, 1913: 84.

Type species *Epicroseius* (*Iphidinychus*) *manicatus* Berlese, 1913: 84, by monotypy.

Notes. Berlese (1913) described the new subgenus *Epicroseius* (*Iphidinychus*) and used the correct genus name *Epicroseius* twice, but used the incorrect name *Echinoseius* (*Iphidinychus*) *manicatus* at the head of the description of the type species.

***Yedinychus* Ma, 2015**

Ma (2015) described *Yedinychus* as a new genus of Uropodina, with two included species, *Y. xinjiangensis* Ma, 2015 and *Y. huangshanensis* Ma, 2015. The type species *Y. xinjiangensis* was based on a female, which has a very heavy trifold corniculus, a multi-lobed tritosternum, heavy robust cheliceral digits, and a large number of small sclerites on the dorsal idiosoma. These features place *Yedinychus* in the Sejina rather than the Uropodina. The other species, *Y. huangshanensis*, was described from a single male specimen so its placement is not certain, but it too appears to belong in the Sejina.

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