# Supraspecific names in spider systematic and their nomenclatural problems

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# Supraspecific names in spider systematic and their nomenclatural problems

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**Abstract**. Three different types of the names used in spider systematics are recognized and discussed: 1) typified taxonomic names, 2) non-typified taxonomic names, and 3) non-taxonomic names. Typified names are those from genus to superfamily group names; they are regulated by the ICZN. Non-typified names are used for taxonomic groups higher than superfamilies (e.g., Haplogynae, Mesothelae, etc.); they are not regulated by the ICZN but have an authorship, a fixed year of publication and are incorporated in a hierarchical classification. Non-taxonomic names are not regulated by any formal rules, unranked, have no authorship or description, and are non-typified. Some difficulties connected with the non-typified names in spider systematics are briefly discussed. Senior synonyms of some non-typified and non-taxonomic names are discussed, and suggestions are given on how to deal with the non-typified names lacking senior synonyms.

**Keywords**: clade name, non-typified name, typified name.

**Zusammenfassung**. **Supraspezifische Namen in der Spinnensystematik und ihre nomenklatorischen Probleme.** Drei verschiedene Namenstypen in der Spinnensystematik werden diskutiert: 1) typisierte taxonomische Namen, 2) nicht-typisierte taxonomische Namen sowie 3) nicht-taxonomische Namen. Typisierte Namen reichen von Gattungen bis zu Überfamilien und sind durch die ICZN reguliert. Nicht-typisierte Namen werden für taxonomische Einheiten oberhalb von Überfamilien verwendet (z. B. Haplogynae, Mesothelae), sind nicht durch die ICZN reguliert, haben aber Autoren, ein Erstbeschreibungsjahr und werden in hierarchischen Klassifikationen verwendet. Nicht-taxonomische Namen sind ungeregelt, nicht hierarchisch und ihnen sind keine Erstautoren oder Erstnennungen zugeordnet. Schwierigkeiten der nicht-typisierten Namen werden ebenso diskutiert, wie ältere Synonyme einiger nicht-typisierter und nicht-taxonomischer Namen. Es werden Vorschläge gemacht wie mit den nicht-typisierten Namen ohne ältere Synonyme umgegangen werden kann.

Terminology in all fields of science, including arachnology, is critically important because, if used inconsistently, it may lead to confusion (Lotte 1961, Anonymous 1968). For instance, if the same term is applied to different morphological structures or phenomena (e.g., the conductor in Lycosidae and other members of the RTA-clade) or if various terms are used for the same (= homological) morphological structures (e.g., spermatheca – receptacle – receptaculum, vulva – endogyne – uterus externus). In taxonomy/systematics, names play a very important role, helping to communicate biological information. Unfortunately, as with the terminology, there is no consistency in their use. There are at least three different types of names used by arachnologists: 1) typified names, 2) non-typified names, and 3) non-taxonomic names.

What are typified names? These are the scientific family used for taxa higher than species group names up to the family group names (superfamily) (ICZN 2012). Each genus group name has a type species (= generotype), while for family group names a genus name is used as the type. For example, the type genus of the family Lycosidae Sundevall, 1833 and its nominative subfamily Lycosinae Sundevall, 1833 is *Lycosa* Latreille, 1804. Consequently, the type family of the superfamily Lycosoidea Sundevall, 1833 is Lycosidae.

Compared to typified names, taxonomic group names higher than the superfamily rank have no designated type families, and hence are called non-typified names (e.g., almost all order names in Hexapoda, Vertebrata, etc.). This is because the International Code of Zoological Nomenclature (ICZN) only governs the naming of taxa from species (subspecies, species, superspecies) to the family (subfamily, family, superfamily) group names (ICZN 2012: Article 1.2.2). Taxonomic names higher than superfamilies are not regulated by the ICZN.

The third type of names that are commonly used in spider systematics are non-taxonomic names, for example, RTA-clade, Lost Trachea clade, Oval Calamistrum clade, etc. Such names are not regulated by any rules and are applicable to any taxon, from species to phyla ranks. These are poorly technical, non-scientific (and not Latinized) names, as compared to those regulated by the ICZN.

The aims of the present paper are (1) to briefly discuss all three name groups and their use in spider systematics, and (2) to indicate some nomenclatural problems related to non-typified and non-taxonomic arachnological names and to suggest possible ways to resolve them.

## Typified names

These names present no problems because their use is strictly governed by the ICZN (2012), which is a set of very detailed rules compiled by an international consortium of experts in zoological systematics and agreed upon by the entire zoological community. Thus, when a spider genus name is discussed, its type species (i.e., the only objective member thereof) has to be considered in the first place. If a tribe, subfamily, family or superfamily name is discussed, the type genus needs to be primarily considered.

Fairly often, arachnologists, like other zoologists, use typified names at a level higher than family group names: e.g., Araneomorphae (based on Araneidae Clerck, 1757), Liphistiomorphae (based on Liphistiidae Thorell, 1869), or Theraphosomorphae (based on Theraphosidae Thorell, 1869). There are also group names that could be conventionally treated as partly "typified" names, for example:

– Mygalomorphae, based on *Mygale* Latreille, 1802, a junior homonym of *Mygale* Cuvier, 1800 (Mammalia), and the families Mygalides Sundevall, 1833 and Mygalidae Blackwall, 1845.
– Araneae, based on *Aranea* Latreille, 1804, the suppressed name with the type species *Aranea domestica* Clerck, 1757

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which is currently placed in *Tegenaria* C.L. Koch, 1837 (Agelenidae C.L. Koch, 1837).
– Avicularioidea (as an infraorder), based on Avicularidae Simon, 1874, a junior synonym of Theraphosidae.

There are a number of non-typified names of unclear taxonomic rank, which can be considered infraorders (not regulated by the ICZN) or superfamilies, for example:
– Argiopoidea, based on Argiopidae Simon, 1890 (a junior synonym of Araneidae Clerck, 1757).
– Drassiformes, based on *Drassus* Walckenaer, 1805 (a junior synonym of *Gnaphosa* Latreille, 1804) and Drassoidae Thorell, 1870.
– Epeiriformes, based on *Epeira* Walckenaer, 1805 (a junior synonym of *Araneus* Clerck, 1757) and Epeiridae Fitch, 1882, a junior synonym of Araneidae Clerck, 1757, which is the oldest name in zoological systematics (ICZN 2012: Article 3.1).

There are many more names from family groups or a higher rank. An almost complete list of typified names for spider taxa higher than the family group is provided by Kluge (2017).

**Non-typified names**

There are many non-typified arachnological names, for instance (the currently used names are given in bold): Apneumanatae, Artionycha, Cribellatae, Deuterotracheata, **Dionycha**, Dipneumonatae, Ecribellatae, **Entelegynae**, **Haplogynae**, Hypodemata, Labidognatha, **Mesothelae**, Nelipoda, Neocribellatae, Octostiatae, **Opisthothelae (=** Opistothelae), Orbicularia, Orthognatha, **Palaeocribellatae** (= Paleocribellatae), Perissonycha, Proterotracheata, Quadrostiatae, Sexoistiatae, **Synspermiata**, Tetrapulmonata, Trionycha, etc. Almost a complete list of non-typified names suggested for spider taxa higher than the family group are provided by Kluge (2017).

Although some of these names are widely used, they are subject to much confusion. But why? For instance, the name Haplogynae Simon, 1893 was described to accommodate six families Caponiidae, Dysderidae, Hadrotarsidae, Leptonetidae, Oonopidae and Sicariidae. Hadrotarsidae are now treated as a subfamily of Theridiidae (Entelegynae), whereas Leptonetidae remain apart from other haplogynes (Wheeler et al. 2017). The remaining families currently included in the Haplogynae have different types of female copulatory organs: viz., Caponiidae, Dysderidae, Oonopidae and Telemidae have unpaired receptacles, whereas Filistatidae, Scytodidae and Sicariidae have paired receptacles. The single receptacle of Telemidae strongly differs from those of all other spider families in having the weakly sclerotized sac-like tube and therefore this family is likely to be excluded from the Haplogynae.

Simon's haplogyne families are currently split into more families, and many new families (e.g., Drymusidae, Ochyroceratidae, Orsolobidae, Segestriidae, Telemidae, etc.) have been added. Since the very beginning, Haplogynae had been a polyphyletic taxon due to the inclusion of Hadrotarsidae. Since Haplogynae is a non-typified name having no designated type family, it is impossible to properly discuss its limits and relationships. For instance, Lehtinen (1967) placed Filistatidae in the Haplogynae, although this taxon was originally placed in Mygalomorphae, then moved to Cribellatae, and later placed among the "classical Haplogynae (including the cribellate family Filistatidae)" (Platnick et al. 1991: p. 1). Now it is impossible to meaningfully discuss what the true Haplogynae is, or which of the families it currently contains should be excluded, because this taxon is not associated with any designated type family name.

A similar situation exists with Dionycha Petrunkevitch, 1928, the taxon uniting spider families having two tarsal claws. Recently, M.J. Ramírez, in his presentation on the 20th Congress of Arachnology (cf. Ramírez et al. 2016), argued that Sparassidae should not be a member of the Dionycha, although all sparassids have two claws and the family was included in this group by Petrunkevitch, the original author of this taxon. Yet, as the Dionycha has no designated type family, it is impossible to prove or refute the statement by Ramírez and his co-authors.

At the first glance, Mesothelae Pocock, 1892 (= Liphistiomorphae) looks like a well-defined taxon consisting of the single family Liphistiidae, which would be true if only extant spider families were considered. Yet, there are at least six fossil families in the group: Arthrolycosidae Frič, 1904, Arthromygalidae Petrunkevitch, 1923, Pyritaraneidae Petrunkevitch, 1953, Burmathelidae Wunderlich, 2017, Cretaceothelidae Wunderlich, 2017 and Parvithelidae Wunderlich, 2017. Although the Mesothelae is a non-typified name, it is clear what family was used as its "type" (by original monotypy). The same holds true with Palaeocribellatae Caporiacco, 1938, the group that was originally proposed for Hypochilidae Marx, 1888 only, and therefore Hypochilidae could be considered in some respects the type family of Palaeocribellatae.

There is another major problem associated with non-typified names: they are largely based on morphological characters and hence their names are often homonymous (= equivalent) with morphological terms. For example, the term 'haplogynes' can be either used for a taxon, or for spiders without an epigyne; the 'dionychans' can refer to either a taxon, or to the morphological trait seen in Sparassidae, which according to M.J. Ramírez do not belong to the Dionycha. Often it is not clear whether an author wrote about a taxonomic or morphological group. For instance, the fundamental work by Platnick et al. (1991) is entitled as follows: "Spinneret morphology and the phylogeny of haplogyne spiders". However, in the abstract (Ibid.: p. 1), the authors wrote: "Scanning electron microscopy is used to survey the spinneret morphology of representatives of 47 genera of araneomorph spiders with haplogyne female genitalia. ... but including those palpimanoid and orbicularian taxa with haplogyne females". Both, the taxonomic name and the morphological term, are mixed up in the abstract. Based on this quote, there are no differences between 'haplogyne female genitalia' and 'haplogyne females', although the authors dealt both with the Haplogynae genera and with those of the Entelegynae having a haplogyne (the morphological term without a strict definition) type of copulatory organs. The same authors used the terms 'haplogyne spinneret morphology', although the female copulatory organs have no spinnerets. Some authors write about 'secondary haplogynes' spiders or 'haplogyne palp' meaning the male palp, although the prefix 'gyne' refers either to a female or to a female reproductive organ.

Some spider families outside of the Dionycha (sensu Ramirez et al. 2016) have two claws. The family Pholcidae

is assigned to Synspermiata (Wheeler et al. 2017), although that synspermia was found only in a single genus of the eight studied (Michalik & Ramirez 2014). Lamponidae belonging to Opisthothelae have their spinnerets situated close to the epigastral furrow, close to the middle part of the venter, viz. in the same way as in Mesothelae. Orb webs (cf. Orbicularia) are known in the unrelated Araneoidea and Uloboridae (cf. Wheeler et al. 2017), and this is why these groups have been united in Orbicularia for a long time.

Another problem connected with non-typified names is the lack of a hierarchy and a principal impossibility to establish it. For example, it is not clear what taxon has a higher rank, Haplogynae or Synspermiata, because both groups have no distinct or rigorously specified limits. Does Haplogynae include Synspermiata, or vice versa, is Haplogynae a taxon of Synspermiata?

Finally, non-typified names cannot be synonymized with other names, unless they are monotypic.

**Non-taxonomic names**

These are a kind of technical or conventional names that are not-Latinized and in most cases consist of several words. Non-taxonomic names are common in the contemporary taxonomy, including arachnology, especially in cladistics/phylogenetic studies (as clade names), although they are not regulated by any rules. These names lack a hierarchy and sometimes carry no meaningful information.

A clade name can refer to a species group or to a phylum. Such names can derive from a particular character (e.g., RTA-clade, Lost Trachea clade, Cylindrical Gland Spigot clade, Oval Calamistrum clade, Oblique Median Tapetum clade) or lack any indication as to which spider group it could be referred (e.g., the Pedipalpi or Marronoid clade sensu Wheeler et al. 2017). As with non-typified names, clade names are not fixed with a certain taxon (type).

The most common clade name in arachnology is the RTA-clade, uniting spiders having the retrolateral tibial apophysis (RTA) in the male palp with those (e.g., Lycosidae) lacking it. Furthermore, there are subfamilies/genera that are not included in the RTA-clade but possess the RTA: e.g., *Diphya* Nicolet, 1849 (Tetragnathidae, Dyphyinae); many Erigoninae (Linyphiidae); *Pikelinia* Mello-Leitão, 1946, *Lihuelistata* Ramírez & Grismado, 1996 (Filistatidae). Incidentally, the oldest taxonomic name for the RTA-clade seems to be Lycosoformes Simon, 1864, which is based on the family lacking the RTA.

The most unusual clade name seems to be the Marronoid clade (spelled either as Marronoid or marronoid, with adding 'clade' or 'group') "grouping together several spider families lacking striking characters" (Wheeler et al. 2017: p. 23). In fact, this clade was suggested to accommodate spider families which cannot be united by any other character(s).

Some arachnologists specify that they deal with a clade by just adding the word 'clade', while others manipulate with names without reference to their status.

In contrast to scientific names, non-taxonomic names have no authorship and they can (dis)appear without any justification. To describe/introduce a new typified name, an author should provide a detailed justification following the specify ICZN regulations, but it seems that there is no need to specify why a clade has its name and what is its etymology? For instance, here are the clade names introduced and used in the latest spider phylogeny (Wheeler et al. 2017): viz., Divided Cribellum clade, Canoe Tapetum clade, Reduced Piriform clade, Spineless Femur clade, Araneoid Sheet Web Weavers (the word 'clade' is not used for this group).

Some arachnological clade names introduced in cladistic/phylogenetic studies have a hybrid status: e.g., Distal Erigonines, Higher Araneoids, Higher Lycosoids, Derived Araneoids. These names contain a taxon name, but have no information on what could be their type groups, and thus they are non-typified names. Furthermore, these as well as clade names such as RTA-clade, Divided Cribellium clade, Canoe Tapetum clade, Reduced Piriform clade, Spineless Femur clade and many others cannot be treated as taxonomic names because they are not uninominal as required by the ICZN (2012: Article 4.1).

**Discussion**

What could be a possible approach for sorting out non-typified names? There is no universal rule, and several suggestions can be considered regarding different cases.

1. In fact, several non-typified names do have senior synonyms, which are often more advantageous than those currently used. Although the ICZN does not formally regulate names higher than family groups, the conventional principle of priority seems to be applicable in such cases as well. Below, some examples of non-typified names that have senior synonyms are discussed: Araneae, Dionycha, Haplogynae, Entelegynae.

   **Aranei** is based on *Araneus* Clerck, 1757 and Araneidae Clerck, 1757, the two oldest names in zoology (ICZN 2012, Kluge 2007, 2016). Araneae Linnaeus, 1758, is based on the suppressed name *Aranea* Linnaeus, 1758, of which the type species is *Araneus domesticus* Clerck, 1757 (= *Tegenaria d.*, Agelenidae) (see Kluge 2007, ICZN 2009). In addition, the Latin words 'araneus' and 'aranea' have the same root meaning 'spider', but they are of a different grammatical gender. Originally, in the ancient Latin "araneus meant 'spider' and aranea meant 'spider web', but the first century B.C. poet Catullus (68.49) already used aranea to mean 'spider'" (Cameron 2005: p. 279). An additional point in favour of Aranei (not connected with any rules) could be that it is shorter than Araneae and easier to spell and pronounce. Despite the name 'Araneae' was conventionally accepted by a vote on the XIII International Congress of Arachnology (Genève, Switzerland) (see also Savory 1972), this act alone does not suppress the use of 'Aranei', which is the correct grammatical form for the order of spiders (Aranei is a plural from *Araneus*). Yet, in my opinion, the XIII Congress of Arachnology (see CIDA 1996) had no authority to establish special nomenclatural rules and thus 'Aranei' is to be treated as a valid taxonomic name.

   **Thomisiformes** Simon, 1864 is an older name than Dionycha Petrunkevitch, 1928, whereas the scope of this taxon is identical to the classical definition of Dionycha (see above). Therefore, in my opinion, the name 'Thomisiformes' has an advantage over 'Dionycha' and can easily substitute for it. For instance, Dionycha makes it difficult or even impossible to discuss the problem of a correct assignment of the Sparassidae, which according to M.J. Ramírez (his presentation on the 20th Congress of Arachnology) do not belong to Dionycha (see above for more details). The end-

ing of this taxon name can be modified, as it is not regulated by the ICZN, and be either Thomisidaeformes or Thomisoidea.

**Scytodiformes** Simon, 1864 is the oldest typified name for Haplogynae Simon, 1893 (and also for Synspermiata) and as such, in my opinion, should be given a priority, despite this act not being regulated by the ICZN. The oldest name for **Entelegynae** should be based on Araneidae, for instance, Araneiformes.

**Hypochilomorphae** Petrunkevitch, 1933 is a senior synonym of Palaeocribellatae Caporiacco, 1938 (originally monotypic, based on Hypochilidae, this name is often used in current classifications). However, there are two more synonyms: Hypochiloidea Lameere, 1933 and Umbellitelariae Marx, 1890 (non-typified name, suggested without any explanations). In my opinion, the name of Petrunkevitch should be further used, because it was given in a family covering all spiders.

2. Although there is no priority rule for taxa higher than a family group name, if a non-typified name is a senior "synonym", in my opinion, the oldest typified name is to be used. For instance, in my opinion, the younger name Liphistiomorphae Petrunkevitch, 1923 could be used instead of Mesothelae Pocock, 1892, because the latter name has no clear limits. In the future, an alternative possibility could be feasible: viz., if an author utilizes a non-typified name, a clear reference to a family that is seen by this author as the type would be extremely helpful to avoid ambiguity in interpretation of that non-typified name. For instance, the type family of Mygalomorphae could be either Theraphosidae, or any other family currently included in it; yet, such ambiguity could have been avoided, if the type family was clearly selected by the author who introduced the name in first place.
3. Although clade names are not scientific/taxonomic, poorly technical and hence there is no formal way to regulate them, some clade names are very popular and accepted by the majority of arachnologists, for instance, the RTA-clade. The oldest taxonomic name that, in my opinion, could be a suitable replacement for the name 'RTA-clade' is Lycosiformes Simon, 1864. Although Thomisiformes also belongs to the RTA-clade, they account only for its part (= Dionycha; see above for more details) and therefore cannot be used as a typified name for the entire RTA-clade.
4. There is another, a rather radical solution on how to operate with non-typified names, for instance, to apply rules of the circumscriptional nomenclature which has many advantages over the traditional nomenclature. Although to date this nomenclature has not yet been employed in the spider systematics, its effectiveness has been demonstrated for insects and their classification (e.g., Kluge 2000). Further details about this nomenclature can be found in Kluge (2010, 2017).

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