



## Nomenclatural notes on the names *Gaeolaelaps* and *Geolaelaps* (Acari: Laelapidae)

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The genus-group names *Geolaelaps* and *Gaeolaelaps* (Acari: Laelapidae) are in widespread use in the formal taxonomic literature of acarology, for a genus or subgenus of predatory soil mites. They are also in use in the literature of ecology and agriculture, especially in discussions of the biological control of western flower thrips, *Frankliniella occidentalis* (Pergande), and sciarid larvae and gnats of the genus *Bradysia*, in greenhouse vegetables and ornamentals (Zhang, 2003). Examples of usage in mite taxonomy are Karg (1971), Evans & Till (1979) and Casanueva (1993) (*Gaeolaelaps*), and Karg (1979, 1993) and Xu & Liang (1996) (*Geolaelaps*). Examples of usage in ecology and agriculture include House *et al.* (1987) (*Gaeolaelaps*) and Gillespie & Quiring (1990) (*Geolaelaps*). There are many other examples of usage of both of these names in both print and internet documents, and there is considerable confusion surrounding their spelling and authorship. The purpose of this note is to resolve that confusion.

The genus name *Geolaelaps* is often attributed to Berlese (1923). Berlese (1923, page 254) mentioned the name *Geolaelaps* in passing in his discussion of *Hypoaspis hospes* Berlese. However, he did not provide any description of the genus or any indication of a description of the genus, or provide any designation or indication of an available species-group name in combination with it or referred to by bibliographic reference. This name therefore violates the International Code of Zoological Nomenclature (ICZN), Article 12, for names published before 1931 (International Commission of Zoological Nomenclature, 1999), and is a *nomen nudum*, not an available name. It is listed as a *nomen nudum* in the *Zoological Record*, Volume 90, 1953.

The name *Gaeolaelaps* is usually attributed to Trägårdh (1952). Trägårdh (1952, page 66) used the genus name *Gaeolaelaps* and stated that *G. aculeifer* was its type species, apparently referring to a type designation in unpublished notes or work by Berlese. He also stated that *Gaeolaelaps* was mentioned in text by Berlese but never described. Trägårdh did not provide a description of the genus or any bibliographic reference to a description of the genus. *Gaeolaelaps* Trägårdh, 1952 therefore violates ICZN Article 13, for names published after 1931 and is also a *nomen nudum*, not an available name. Trägårdh provided a key to four genera related to *Hypoaspis*, based on specimens in the Berlese collection, but did not include *Gaeolaelaps*. This suggests that Trägårdh himself did not believe that *Gaeolaelaps* was an available name.

Ryke (1963, page 11) used the spelling *Geolaelaps*, attributed it to Berlese (1924) (here referred to as 1923), and said that Berlese placed the species *aculeifer* Canestrini, 1884 in this genus. However, Berlese (1923) never mentioned *aculeifer*, and it seems likely that Ryke too was directly or indirectly referring to some unpublished notes or manuscript of Berlese for that type designation. This point has also been made by Till (1963), who referred to an unpublished usage of *Gaeolaelaps* by Berlese in a manuscript. We have seen photographs of an unpublished manuscript of Berlese's entitled *Genera Mesostigmatum*, which is in the Berlese Acaroteca in Firenze. Page 53 of that manuscript includes hand drawn illustrations of a species of Laelapidae with the inscription "Gen. HYPOASPIS G. Can. Subgen. GÆOLÆLAPS Berl. Typus Gamasus aculeifer G. R. Can." in Berlese's handwriting. The letters GÆ are on a slip of paper that has been glued onto a line on the page to form the name GÆOLÆLAPS, apparently over the top of and in place of an earlier inscription, presumably GE, as part of the name GEOLÆLAPS. This manuscript appears to be what Trägårdh (1952) was referring to for the spelling of the name and the type species of the subgenus, and the source that was then secondarily cited by

Ryke (1963) and Till (1963). However, we repeat that neither this unpublished manuscript nor Trägårdh (1952), Ryke (1963), or Till (1963) make the name or type fixation available.

Hyatt (1964, page 470) used the genus name *Gaeolaelaps* Trägårdh, described the new species *Gaeolaelaps circularis* Hyatt, 1964, and referred to two other species in this genus. His comments make it clear that he considered *Gaeolaelaps* to have been monotypic until that time, including only *G. aculeifer*. However, he did not provide a description of the genus or a bibliographic reference to a description of the genus. The name *Gaeolaelaps* as used by Hyatt (1964) therefore violates Article 13 of ICZN, and is also a *nomen nudum*.

Evans and Till (1966, page 159) referred to *Gaeolaelaps* Trägårdh, 1952 as a subgenus of *Hypoaspis* Canestrini, 1884. They designated *Laelaps aculeifer* Canestrini, 1884 as its type species and provided a key to subgenera which suffices as a description to distinguish *Gaeolaelaps* from other subgenera of *Hypoaspis*. This publication therefore meets all the criteria required to make the name *Gaeolaelaps* available, and does so for the first time. A careful search has revealed no other usages of these names prior to 1966 that have any nomenclatural status. We therefore conclude that the correct spelling and authorship of this name is *Gaeolaelaps* Evans and Till, 1966. The type species of this genus or subgenus is *Laelaps aculeifer* Canestrini, 1884, by original designation, in Evans & Till (1966). This type species designation is valid even though Evans & Till wrongly attributed the authorship of the name *Gaeolaelaps* to Trägårdh (1952) (ICZN, Article 67.7).

Any usages of either *Geolaelaps* or *Gaeolaelaps* before Evans and Till (1966) refer to names that are not available for nomenclatural purposes. *Gaeolaelaps*, as the original spelling of the name presented by Evans and Till (1966), is the “correct original spelling” which must be preserved unaltered unless it is demonstrably incorrect, according to provisions in the ICZN, Article 32. The change from *Gaeolaelaps* to *Geolaelaps* cannot be considered as a justified or unjustified emendation, since no author has provided an explicit statement of intention to make this change, as would be required by ICZN, Article 33. Further, any change from *Gaeolaelaps* to *Geolaelaps* or *vice versa* cannot be justified on the grounds of etymology, since no etymology has been published for either of these names. Therefore, any usage of the name *Geolaelaps* after Evans and Till (1966) must be considered as an incorrect subsequent spelling of *Gaeolaelaps*. It should also be noted that the names *Gaeolaelaps* and *Geolaelaps* are not homonyms, both because of the one-letter difference in spelling (ICZN Article 56.2) and because *Geolaelaps* has never been made available (ICZN Article 54.2).

Two other publications relevant to this subject deserve mention. Hunter and Yeh (1969) summarised the history of these names, but chose to use the incorrect spelling *Geolaelaps*, and wrongly attributed this spelling to Evans & Till (1966). Casanueva (1993) consistently used the spelling *Gaeolaelaps*, but referred to its authorship as both Trägårdh (1952) (page 24) and Berlese (page 25). We have shown that this name was not made available by either of these authors.

We make no comment here about the taxonomic status of *Gaeolaelaps*. This taxon has been variously treated as a full genus, a subgenus of *Hypoaspis*, or a junior synonym of *Hypoaspis*. Its type species *Laelaps aculeifer* Canestrini, 1884 is often referred to as *Hypoaspis aculeifer*, implying that *Gaeolaelaps* is either a subgenus or a synonym of *Hypoaspis* (e.g. Tenorio, 1982; Kasuga *et al.*, 2006, among many others). Resolution of these taxonomic questions will depend on a revision of this and related taxa, which is being attempted as a separate project (M. Shaw, pers. comm). Whatever its taxonomic status, this taxon should be referred to as *Gaeolaelaps* Evans and Till, 1966.

We are deeply grateful to Roberto Nannelli and Marisa Castagnoli of the Berlese Acaroteca, Firenze, for their generosity in providing information about the Berlese manuscript. We also thank Jerry Krantz, Dave Walter, Fred Beau-lieu, Matt Shaw and Barry OConnor for their constructive comments on an earlier version of this paper.

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