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Source: Arachnologische Mitteilungen: Arachnology Letters, 59(1) : 22-29

Published By: Arachnologische Gesellschaft e.V.

URL: <https://doi.org/10.30963/aramit5904>

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## How to deal with destroyed type material? The case of Embrik Strand (Arachnida: Araneae)

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doi: 10.30963/aramit5904

**Abstract.** When the museums of Lübeck, Stuttgart, Tübingen and partly of Wiesbaden were destroyed during World War II between 1942 and 1945, also all or parts of their type material were destroyed, among them types from spider species described by Embrik Strand between 1906 and 1917. He did not illustrate type material from 181 species and one subspecies and described them only in an insufficient manner. These species were never recollected during more than 110 years and no additional taxonomically relevant information was published in the arachnological literature. It is impossible to recognize them, so we declare these 181 species here as **nomina dubia**. Four of these species belong to monotypic genera, two of them to a ditypic genus described by Strand in the context of the mentioned species descriptions. Consequently, without including valid species, the five genera *Carteroniella* Strand, 1907, *Eurypelmella* Strand, 1907, *Theumella* Strand, 1906, *Thianella* Strand, 1907 and *Tmeticides* Strand, 1907 are here also declared as **nomina dubia**. *Palystes modificus minor* Strand, 1906 is a junior synonym of *P. superciliosus* L. Koch, 1875 **syn. nov.**

**Keywords:** nomen dubium, scientific description, scientific illustration, spiders

**Zusammenfassung. Wie geht man mit zerstörtem Typenmaterial um? Der Fall von Embrik Strand (Arachnida: Araneae).** Durch die Zerstörung der Museen in Lübeck, Stuttgart, Tübingen und teilweise in Wiesbaden im 2. Weltkrieg wurde auch alles Typenmaterial oder große Teile davon zerstört, darunter Typenmaterial von Spinnenarten, die durch Embrik Strand zwischen 1906 und 1917 beschrieben wurden. Für das Typenmaterial von 181 Arten und einer Unterart publizierte er keine Illustrationen und beschrieb sie nur unzureichend. Seit über 110 Jahren wurden diese Arten nicht mehr gesammelt und auch in der arachnologischen Literatur wurden keine weiteren Informationen zu ihnen veröffentlicht. Es ist heute unmöglich, diese Arten zu erkennen, daher erklären wir diese 181 Arten hier zu **nomina dubia**. Vier dieser Arten gehören zu monotypischen Gattungen, zwei gehören zu einer ditypischen Gattung, von Strand für seine neuen Arten geschaffen. Da diese Gattungen keine gültigen Arten enthalten, erklären wir die fünf Gattungen *Carteroniella* Strand, 1907, *Eurypelmella* Strand, 1907, *Theumella* Strand, 1906, *Thianella* Strand, 1907 and *Tmeticides* Strand, 1907 hier ebenfalls zu **nomina dubia**. *Palystes modificus minor* Strand, 1906 ist ein jüngeres Synonym von *P. superciliosus* L. Koch, 1875 **syn. nov.**

Species descriptions on the basis of type material is one of the cornerstones of taxonomy. Type material is stored in safe places, usually museums and comparable collections, so it is always possible to compare the described species with the original material. But what if this type material gets destroyed? During the last centuries, wars, fires and other catastrophes as well as inappropriate or lacking maintenance have already destroyed a lot of type material, creating a difficult situation for taxonomists.

During World War II, in the night of 28./29. Mar. 1942, the city of Lübeck was the first German city that was considerably destroyed by allied air forces. The museum in the centre of the city, that contained the natural history collection, was completely destroyed and the collection material was burnt. This also concerned the spider collection with all type material (Füting pers. comm.). The natural history museum of Stuttgart, initially the “Kurfürstliches Naturalien-Cabinet”, was hit when the city was bombed in September 1944. The building burnt out completely and the collections were destroyed (Roewer 1955, 1959, 1960, Renner 1988, Renner pers. comm.). In the city of Tübingen 800 buildings were damaged or destroyed by air bombing. The spider collection in a small museum at the University was (probably together with other collection material) stored in wooden boxes that survived the end of the war. After the war, during cleaning-up the build-

ings in 1945, the boxes were “dumped to gain free space”, i.e. they were destroyed (Weber pers. comm.). Parts of the ethanol collection of the Wiesbaden Museum were stored during the war in a gardener’s house in the spa gardens due to their flammability. During an air attack in the night of 2./3. Feb. 1945, this material was entirely destroyed. The museum building including other collections was, however, left without damage (Heineck 1950). On the other hand, two very large natural history museums in Germany survived World War II with less damage: the Senckenberg Museum in Frankfurt/Main and the Natural History Museum in Berlin had enough time to evacuate their collections into safe areas, so that they survived.

From 1906 to 1917, Embrik Strand described 381 spider species and one subspecies from collection material stored in the museums of Lübeck, Stuttgart, Tübingen and Wiesbaden. By analysing his publications (Strand 1906a, 1906b, 1906c, 1907a, 1907b, 1907c, 1907d, 1907e, 1907f, 1908a, 1908b, 1908c, 1915a, 1915b, 1917), we learnt which species he described and where the type material was deposited because in these publications he always stated to which museum the material belonged. This is in remarkable contrast to his usual habit of not indicating where he deposited the type material (Nentwig et al. 2019). In this publication, we deal with the species described by Strand and type material deposited in museums that were later destroyed. Strand also described a series of subspecies, varieties and forms, we investigated earlier (see Nentwig et al. 2019).

From these 382 taxa, a subset of 64 species has meanwhile been declared as *nomina dubia* and 57 species were synonymized with other species. For 79 species, Strand provided illustrations, so that the spiders could (at least theoretically) be recognized, other authors illustrated them, and/or type or non-type material was found in other museums (all information from the World Spider Catalog 2019).

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Academic editor: Konrad Wiśniewski

submitted 15.10.2019, accepted 5.1.2020, online 6.3.2020

For the remaining 182 spider taxa, we state here that:

- Strand deposited the type material in the museums of Lübeck (58 species), Stuttgart (103 species), Tübingen (11 species) and Wiesbaden (9 species and 1 subspecies) and all type material became verifiably destroyed (references in Tab. 1).
- There is no other type or non-type material known.
- Since their description by Strand, during a period of more than 110 years, none of these species has ever been recollected.
- None of these species has been mentioned in other publications, thus there is no further scientific literature about them. This statement does not include taxonomic revisions (such as Dalmás 1921: 292 or Laurent 1946: 311) or catalogue works (such as Bonnet 1955-1959, 1961 and Roewer 1955, 1959, 1960) that only listed the names or repeated Strand's descriptions without further investigations.

- Strand described these species in his characteristic manner, this means, he sometimes delivered long descriptions but useful diagnostic aspects and comparative discussions regarding other (similar) species were often missing (see Nentwig et al. 2019). Illustrations were not provided for any of them. Considering the magnitude of the world's biodiversity known nowadays, it is impossible to recognize these species.
- In 19 cases, Strand's description was based on juvenile specimens, in 153 cases, he had only one sex (41 males, 111 females), and in only 11 cases he had both sexes.

We conclude that without type material or scientific illustrations and useful descriptions, it is impossible to recognize these species and subspecies. Therefore, we declare them here as **nomina dubia**. This concerns the 181 species listed in Tab. 1.

**Tab. 1:** List of species described by Strand 1906–1917 that are here declared as **nomina dubia**. The detailed argumentation is given in the text. M refers to the museums where the type material has been destroyed (L = Lübeck, S = Stuttgart, T = Tübingen, W = Wiesbaden), sex refers to the type material described (m = male, f = female, j = juvenile), the comment row lists references and further comments: (1) Fütting (pers. comm.), (2) Renner (pers. comm.), (3) Weber (pers. comm.), (4) Roewer (1959), (5) Roewer (1960), (6) Renner (1988), (7) Jäger (1998), (8) monotypic genus, (9) ditypic genus.

family/species described as	valid name	reference	M	sex	comment
<b>Araneidae</b>					
<i>Aranea aballensis</i>	<i>Araneus aballensis</i> (Strand, 1906) nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Aranea akakensis</i>	<i>Araneus akakensis</i> (Strand, 1906) nomen dubium	Strand 1906a	S	m	(2) (6)
<i>Aranea bagamoyensis</i>	<i>Araneus bagamoyensis</i> (Strand, 1906) nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Aranea blochmanni</i>	<i>Araneus blochmanni</i> (Strand, 1907) nomen dubium	Strand 1907e	T	f	(3)
<i>Aranea braueri</i>	<i>Araneus braueri</i> (Strand, 1906) nomen dubium	Strand 1906a	S	m	(2) (6)
<i>Aranea caplandensis</i>	<i>Araneus caplandensis</i> (Strand, 1907) nomen dubium	Strand 1907a	L	m	(1)
<i>Aranea haploscapella</i>	<i>Araneus haploscapellus</i> (Strand, 1907) nomen dubium	Strand 1907a	L	f	(1)
<i>Aranea ladschicola</i>	<i>Araneus ladschicola</i> (Strand, 1906) nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Aranea lamperti</i>	<i>Araneus lamperti</i> (Strand, 1907) nomen dubium	Strand 1907a	L	f	(1)
<i>Aranea mea</i>	<i>Araneus meus</i> (Strand, 1907) nomen dubium	Strand 1907a	L	f	(1)
<i>Aranea nigmanni</i>	<i>Araneus nigmanni</i> (Strand, 1906) nomen dubium	Strand 1906b	S	f	(2) (6)
<i>Aranea nossibeae</i>	<i>Araneus nossibeus</i> (Strand, 1907) nomen dubium	Strand 1907c	L	j	(1)
<i>Aranea pabli</i>	<i>Araneus pabli</i> (Strand, 1906) nomen dubium	Strand 1906b	S	f	(2) (6)
<i>Aranea raui</i>	<i>Araneus raui</i> (Strand, 1907) nomen dubium	Strand 1907f	W	j	(7)
<i>Aranea saccalava</i>	<i>Araneus saccalava</i> (Strand, 1907) nomen dubium	Strand 1907c	L	f	(1)
<i>Aranea zela</i>	<i>Araneus zelus</i> (Strand, 1907) nomen dubium	Strand 1907a	L	f	(1)
<i>Aranea zuluana</i>	<i>Araneus zuluanus</i> (Strand, 1907) nomen dubium	Strand 1907a	L	f	(1)
<i>Cyclosa hova</i>	<i>Cyclosa hova</i> Strand, 1907 nomen dubium	Strand 1907c	L	m	(1)
<i>Nemoscolus caudifer</i>	<i>Nemoscolus caudifer</i> Strand, 1906 nomen dubium	Strand 1906b	S	f	(2) (6)
<i>Prasonica affinis</i>	<i>Prasonica affinis</i> Strand, 1906 nomen dubium	Strand 1906a	S	j	(2) (6)
<i>Prasonica olivacea</i>	<i>Prasonica olivacea</i> Strand, 1906 nomen dubium	Strand 1906a	S	j	(2) (6)
<b>Barychelidae</b>					
<i>Nossibeae processigera</i>	<i>Tigidia processigera</i> (Strand, 1907) nomen dubium	Strand 1907a	L	j	(1)
<b>Caponiidae</b>					
<i>Caponia abyssinica</i>	<i>Caponia abyssinica</i> Strand, 1908 nomen dubium	Strand 1908b	S	f	(2) (6)
<b>Clubionidae</b>					
<i>Carteroniella macroclava</i>	<i>Carteroniella macroclava</i> Strand, 1907 nomen dubium	Strand 1907a	L	m	(1) (8)
<i>Clubiona caplandensis</i>	<i>Clubiona caplandensis</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<i>Clubiona limpidella</i>	<i>Clubiona limpidella</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<b>Corinnidae</b>					
<i>Copa auroplumosa</i>	<i>Copa auroplumosa</i> Strand, 1907 nomen dubium	Strand 1907c	L	f	(1)
<i>Corinna longitarsis</i>	<i>Corinna longitarsis</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)

family/species described as	valid name	reference	M	sex	comment
<i>Corinna mandibulata</i>	<i>Corinna mandibulata</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Corinna olivacea</i>	<i>Corinna olivacea</i> Strand, 1906 nomen dubium	Strand 1906a	S	j	(2) (6)
<i>Corinna sanguinea</i>	<i>Corinna sanguinea</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<b>Ctenidae</b>					
<i>Ctenus 5-vittatus</i>	<i>Ctenus quinquevittatus</i> Strand, 1907 nomen dubium	Strand 1907a	L	j	(1)
<i>Ctenus beerwalddi</i>	<i>Ctenus beerwalddi</i> Strand, 1906 nomen dubium	Strand 1906b	S	j	(2) (6)
<i>Ctenus biprocessis</i>	<i>Ctenus biprocessis</i> Strand, 1906 nomen dubium	Strand 1906a	S	m, f	(2) (6)
<i>Ctenus clariventris</i>	<i>Ctenus clariventris</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Ctenus schneideri</i>	<i>Ctenus schneideri</i> Strand, 1906 nomen dubium	Strand 1906b	S	j	(2) (6)
<b>Cyrtoucheniidae</b>					
<i>Ancylotrypa bicornuta</i>	<i>Ancylotrypa bicornuta</i> Strand, 1906 nomen dubium	Strand 1906c	W	m	(7)
<b>Desidae</b>					
<i>Amaurobius blochmanni</i>	<i>Badumna blochmanni</i> (Strand, 1907) nomen dubium	Strand 1907e	T	j	(3)
<i>Aphytoschaema javana</i>	<i>Badumna javana</i> (Strand, 1907) nomen dubium	Strand 1907e	T	f	(3)
<b>Eresidae</b>					
<i>Dresserus nasivulva</i>	<i>Dresserus nasivulva</i> Strand, 1907 nomen dubium	Strand 1907a	S	f	(2) (6)
<b>Gnaphosidae</b>					
<i>Drassodes adisensis</i>	<i>Drassodes adisensis</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Drassodes prosthesimiformis</i>	<i>Drassodes prosthesimiformis</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Drassodes subviduatus</i>	<i>Drassodes subviduatus</i> Strand, 1906 nomen dubium	Strand 1906a	S	m, f	(2) (6)
<i>Drassodes vorax</i>	<i>Drassodes vorax</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Poecilochroa malagassa</i>	<i>Poecilochroa malagassa</i> Strand, 1907 nomen dubium	Strand 1907c	L	m	(1)
<i>Prodidomus lampei</i>	<i>Prodidomus lampei</i> Strand, 1915 nomen dubium	Strand 1915a	W	f	(7)
<i>Prosthesima quadridentata</i>	<i>Zelotes quadridentatus</i> (Strand, 1906) nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Pythonissa chordivulvata</i>	<i>Nomisia chordivulvata</i> (Strand, 1906) nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Scotophaeus bersebaensis</i>	<i>Scotophaeus bersebaensis</i> Strand, 1915 nomen dubium	Strand 1915b	W	f	(7)
<i>Scotophaeus nossibeensis</i>	<i>Scotophaeus nossibeensis</i> Strand, 1907 nomen dubium	Strand 1907c	L	f	(1)
<i>Scotophaeus parvioculis</i>	<i>Scotophaeus parvioculis</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Theuma intermedia</i>	<i>Theuma intermedia</i> Strand, 1915 nomen dubium	Strand 1915b	W	m	(7)
<i>Theumella penicillata</i>	<i>Theumella penicillata</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6) (9)
<i>Theumella typica</i>	<i>Theumella typica</i> Strand, 1906 nomen dubium	Strand 1906a	S	m	(2) (6) (9)
<b>Halonoproctidae</b>					
<i>Latouchia fasciata</i>	<i>Latouchia fasciata</i> Strand, 1907 nomen dubium	Strand 1907d	S	f	(2) (6)
<b>Idiopidae</b>					
<i>Ctenolophus heligmomeriformis</i>	<i>Ctenolophus heligmomeriformis</i> Strand, 1907 nomen dubium	Strand 1907a	S	f	(2) (6)
<i>Idiops bersebanesis</i>	<i>Idiops bersebaensis</i> Strand, 1917 nomen dubium	Strand 1917	W	f	(7)
<b>Linyphiidae</b>					
<i>Tmeticides araneiformis</i>	<i>Tmeticides araneiformis</i> Strand, 1907 nomen dubium	Strand 1907c	L	f	(1) (8)
<b>Lycosidae</b>					
<i>Lycosa brevimetatarsis</i>	<i>Pardosa brevimetatarsis</i> (Strand, 1907) nomen dubium	Strand 1907e	T	f	(3)
<i>Lycosa palliclava</i>	<i>Pardosa palliclava</i> (Strand, 1907) nomen dubium	Strand 1907b	S	m	(2) (6)
<i>Lycosa zorimorpha</i>	<i>Pardosa zorimorpha</i> (Strand, 1907) nomen dubium	Strand 1907c	L	m, f	(1) (4)
<i>Tarentula picturella</i>	<i>Arctosa picturella</i> (Strand, 1906) nomen dubium	Strand 1906a	S	f	(2) (5) (6)
<i>Tarentula schweinfurthi</i>	<i>Arctosa schweinfurthi</i> (Strand, 1906) nomen dubium	Strand 1906b	S	f	(2) (6)
<i>Tarentula urbana molensis</i>	<i>Pirata molensis</i> (Strand, 1908) nomen dubium	Strand 1906a	S	m	(2) (5) (6)
<i>Tarentula urbanides</i>	<i>Hognoides urbanides</i> (Strand, 1907) nomen dubium	Strand 1907c	L	f	(1) (5)
<i>Trochosa rubicundi-colorata</i>	<i>Pirata rubicundicoloratus</i> (Strand, 1906) nomen dubium	Strand 1906a	S	f	(2) (5) (6)
<b>Miturgidae</b>					
<i>Syrisca drassiformis</i>	<i>Syrisca drassiformis</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<b>Nemesiidae</b>					
<i>Hermacha nigromarginata</i>	<i>Hermacha nigromarginata</i> Strand, 1907 nomen dubium	Strand 1907a	L	m	(1)
<i>Pseudohermacha annulipes</i>	<i>Entypesa annulipes</i> (Strand, 1907) nomen dubium	Strand 1907a	L	j	(1)

family/species described as	valid name	reference	M	sex	comment
<b>Oxyopidae</b>					
<i>Oxyopes abebae</i>	<i>Oxyopes abebae</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Oxyopes africanus</i>	<i>Oxyopes africanus</i> Strand, 1906 nomen dubium	Strand 1906a	S	m	(2) (6)
<i>Oxyopes akakensis</i>	<i>Oxyopes akakensis</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Oxyopes erlangeri</i>	<i>Oxyopes erlangeri</i> Strand, 1906 nomen dubium	Strand 1906a	S	m	(2) (6)
<i>Oxyopes exsiccatus</i>	<i>Oxyopes exsiccatus</i> Strand, 1907 nomen dubium	Strand 1907b	S	f	(2) (6)
<i>Oxyopes hostides</i>	<i>Oxyopes hostides</i> Strand, 1906 nomen dubium	Strand 1906a	S	m	(2) (6)
<i>Oxyopes inconspicuus</i>	<i>Oxyopes inconspicuus</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Oxyopes infidelis</i>	<i>Oxyopes infidelis</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Oxyopes juvencus</i>	<i>Oxyopes juvencus</i> Strand, 1907 nomen dubium	Strand 1907b	S	j	(2) (6)
<i>Oxyopes lenzi</i>	<i>Oxyopes lenzi</i> Strand, 1907 nomen dubium	Strand 1907a	L	m, f	(1)
<i>Oxyopes lineatifemur</i>	<i>Oxyopes lineatifemur</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Oxyopes luteo-aculeatus</i>	<i>Oxyopes luteoaculeatus</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Oxyopes notivittatus</i>	<i>Oxyopes notivittatus</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Oxyopes oranicola</i>	<i>Oxyopes oranicola</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Oxyopes sternimaculatus</i>	<i>Oxyopes sternimaculatus</i> Strand, 1907 nomen dubium	Strand 1907a	L	m, f	(1)
<i>Oxyopes subjavanus</i>	<i>Oxyopes subjavanus</i> Strand, 1907 nomen dubium	Strand 1907e	T	f	(3)
<b>Palpimanidae</b>					
<i>Palpimanus sanguineus</i>	<i>Palpimanus sanguineus</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<b>Philodromidae</b>					
<i>Philodromus caffer</i>	<i>Philodromus caffer</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<i>Philodromus problematicus</i>	<i>Philodromus problematicus</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Thanatus multipunctatus</i>	<i>Thanatus multipunctatus</i> Strand, 1906 nomen dubium	Strand 1906a	S	m, f	(2) (6)
<i>Thanatus paucipunctatus</i>	<i>Thanatus paucipunctatus</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Tibellus vosseleri</i>	<i>Tibellus vosseleri</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<b>Pholcidae</b>					
<i>Smeringopus affinitatus</i>	<i>Smeringopus affinitatus</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<b>Pisauridae</b>					
<i>Dolomedes lomensis</i>	<i>Dolomedes lomensis</i> Strand, 1906 nomen dubium	Strand 1906b	S	j	(2) (6)
<i>Dolomedes submarginali-vittatus</i>	<i>Dolomedes submarginalivittatus</i> Strand, 1907 nomen dubium	Strand 1907e	T	f	(3)
<i>Hygropoda madagascarica</i>	<i>Hygropoda madagascarica</i> Strand, 1907 nomen dubium	Strand 1907c	L	f	(1)
<b>Salticidae</b>					
<i>Carrhotus aeneochelis</i>	<i>Carrhotus aeneochelis</i> Strand, 1907 nomen dubium	Strand 1907e	T	m, f	(3)
<i>Cyrrba bidentata</i>	<i>Cyrrba bidentata</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Giuiria unica</i>	<i>Giuiria unica</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Hyllus aethiopicus</i>	<i>Hyllus aethiopicus</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Hyllus erlangeri</i>	<i>Hyllus erlangeri</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Hyllus fur</i>	<i>Hyllus fur</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Hyllus fusciventris</i>	<i>Hyllus fusciventris</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Hyllus lugubrellus</i>	<i>Hyllus lugubrellus</i> Strand, 1908 nomen dubium	Strand 1908a	L	m	(1)
<i>Hyllus manensis</i>	<i>Hyllus manensis</i> Strand, 1906 nomen dubium	Strand 1906a	S	m	(2) (6)
<i>Hyllus nossibeensis</i>	<i>Hyllus nossibeensis</i> Strand, 1907 nomen dubium	Strand 1907c	L	f	(1)
<i>Hyllus pachypoessae</i>	<i>Hyllus pachypoessae</i> Strand, 1907 nomen dubium	Strand 1907a	L	j	(1)
<i>Hyllus thyeniformis</i>	<i>Hyllus thyeniformis</i> Strand, 1906 nomen dubium	Strand 1906a	S	m	(2) (6)
<i>Hyllus virgillus</i>	<i>Hyllus virgillus</i> Strand, 1907 nomen dubium	Strand 1907c	L	j	(1)
<i>Icius pseudocellatus</i>	<i>Icius pseudocellatus</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<i>Myrmarachne patellata</i>	<i>Myrmarachne patellata</i> Strand, 1907 nomen dubium	Strand 1907b	S	m	(2) (6)
<i>Pellenes aethiopicus</i>	<i>Pellenes aethiopicus</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Pellenes mimicus</i>	<i>Pellenes mimicus</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Philaeus steudeli</i>	<i>Philaeus steudeli</i> Strand, 1906 nomen dubium	Strand 1906b	S	m	(2) (6)
<i>Phlegra desquamata</i>	<i>Phlegra desquamata</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)

family/species described as	valid name	reference	M	sex	comment
<i>Rhene spuridens</i>	<i>Rhene spuridens</i> Strand, 1907 nomen dubium	Strand 1907e	T	f	(3)
<i>Thianella disjuncta</i>	<i>Thianella disjuncta</i> Strand, 1907 nomen dubium	Strand 1907e	T	m	(3) (8)
<i>Thyene scalarinotum</i>	<i>Thyene scalarinota</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<b>Scytodidae</b>					
<i>Scytodes bergeri</i>	<i>Scytodes bergeri</i> Strand, 1915 nomen dubium	Strand 1915b	W	m, f	(7)
<i>Scytodes subthoracica</i>	<i>Scytodes subthoracica</i> Strand, 1906 nomen dubium	Strand 1906b	S	f	(2) (6)
<i>Scytodes suffusa</i>	<i>Scytodes suffusa</i> Strand, 1906 nomen dubium	Strand 1906b	S	f	(2) (6)
<b>Segestriidae</b>					
<i>Ariadna viridis</i>	<i>Ariadna viridis</i> Strand, 1906 nomen dubium	Strand 1906b	S	f	(2) (6)
<b>Sicariidae</b>					
<i>Loxoscella pallidecolorata</i>	<i>Loxosceles pallidecolorata</i> (Strand, 1906) nomen dubium	Strand 1906a	S	f	(2) (6)
<b>Sparassidae</b>					
<i>Heteropoda graaflandi</i>	<i>Heteropoda graaflandi</i> Strand, 1907 nomen dubium	Strand 1907f	W	m	(7)
<i>Heteropoda rufognatha</i>	<i>Heteropoda rufognatha</i> Strand, 1907 nomen dubium	Strand 1907b	S	m	(2) (6)
<i>Heteropoda veiliana</i>	<i>Heteropoda veiliana</i> Strand, 1907 nomen dubium	Strand 1907b	S	m	(2) (6)
<i>Heteropoda warthiana</i>	<i>Heteropoda warthiana</i> Strand, 1907 nomen dubium	Strand 1907b	S	j	(2) (6)
<i>Nonianus unilateralis</i>	<i>Nonianus unilateralis</i> Strand, 1908 nomen dubium	Strand 1908	W	m	(7)
<i>Olios soratensis</i>	<i>Olios soratensis</i> Strand, 1907 nomen dubium	Strand 1907a	L	m	(1)
<i>Palystes spiralis</i>	<i>Palystes spiralis</i> Strand, 1907 nomen dubium	Strand 1907c	L	m	(1)
<i>Pediana aurochelis</i>	<i>Pediana aurochelis</i> Strand, 1907 nomen dubium	Strand 1907e	T	j	(3)
<i>Torania manni</i>	<i>Barylestis manni</i> (Strand, 1906) nomen dubium	Strand 1906b	S	f	(2) (6)
<b>Tetragnathidae</b>					
<i>Leucauge abbajae</i>	<i>Leucauge abbajae</i> Strand, 1907 nomen dubium	Strand 1907a	S	f	(2) (6)
<i>Leucauge auronotum</i>	<i>Leucauge auronotum</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<i>Leucauge profundi-foveata</i>	<i>Leucauge profundifoveata</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Leucauge tetragnathella</i>	<i>Leucauge tetragnathella</i> Strand, 1907 nomen dubium	Strand 1907c	L	f	(1)
<i>Orsinome vorkampiana</i>	<i>Orsinome vorkampiana</i> Strand, 1907 nomen dubium	Strand 1907c	L	m, f	(1)
<i>Pachygnatha africana</i>	<i>Pachygnatha africana</i> Strand, 1906 nomen dubium	Strand 1906a	S	m, f	(2) (6)
<i>Parameta defecta</i>	<i>Parameta defecta</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Tetragnatha lamperti</i>	<i>Tetragnatha lamperti</i> Strand, 1906 nomen dubium	Strand 1906a	S	m, f	(2) (6)
<b>Theraphosidae</b>					
<i>Brachionopus leptopelmiformis</i>	<i>Brachionopus leptopelmiformis</i> Strand, 1907 nomen dubium	Strand 1907a	L	m	(1)
<i>Cryptopholis sargi</i>	<i>Citharacanthus sargi</i> (Strand, 1907) nomen dubium	Strand 1907d	S	f	(2) (6)
<i>Eurypelmella masculina</i>	<i>Eurypelmella masculina</i> Strand, 1907 nomen dubium	Strand 1907d	S	m	(2) (6) (8)
<i>Haplopelma robustum</i>	<i>Cyriopagopus robustus</i> (Strand, 1907) nomen dubium	Strand 1907d	S	f	(2) (6)
<i>Harpactira guttata</i>	<i>Harpactira guttata</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<i>Heterothele villosella</i>	<i>Heterothele villosella</i> Strand, 1907 nomen dubium	Strand 1907a	L	m	(1)
<i>Hysterochrates affinis</i>	<i>Hysterochrates affinis</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<i>Hysterochrates Haasi</i>	<i>Hysterochrates haasi</i> Strand, 1906 nomen dubium	Strand 1906b	S	f	(2) (6)
<i>Hysterochrates minimus</i>	<i>Phoneyusa minima</i> (Strand, 1907) nomen dubium	Strand 1907a	L	f	(1)
<i>Hysterochrates spellenbergi</i>	<i>Hysterochrates spellenbergi</i> Strand, 1906 nomen dubium	Strand 1906b	S	f	(2) (6)
<i>Hysterochrates vosseleri</i>	<i>Hysterochrates vosseleri</i> Strand, 1906 nomen dubium	Strand 1906b	S	f	(2) (6)
<i>Loxoptygella erlangeri</i>	<i>Loxoptygus erlangeri</i> (Strand, 1906) nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Melopoeus salangensis</i>	<i>Cyriopagopus salangense</i> (Strand, 1907) nomen dubium	Strand 1907d	S	f	(2) (6)
<i>Monocentropella stridulantissima</i>	<i>Eumenophorus stridulantissimus</i> (Strand, 1907) nomen dubium	Strand 1907e	T	m	(3)
<i>Phormictopus brasiliensis</i>	<i>Phormictopus brasiliensis</i> Strand, 1907 nomen dubium	Strand 1907d	S	f	(2) (6)
<i>Pseudhupalopus aculeatus</i>	<i>Pseudhupalopus aculeatus</i> Strand, 1907 nomen dubium	Strand 1907a	L	m	(1)
<i>Selenocosmia subvulpina</i>	<i>Selenocosmia subvulpina</i> Strand, 1907 nomen dubium	Strand 1907d	S	m	(2) (6)
<i>Selenogyrus brunneus</i>	<i>Selenogyrus brunneus</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<i>Sorata monticola</i>	<i>Grammostola monticola</i> (Strand, 1907) nomen dubium	Strand 1907a	L	f	(1)

family/species described as	valid name	reference	M	sex	comment
<b>Theridiidae</b>					
<i>Argyrodes meus</i>	<i>Argyrodes meus</i> Strand, 1907 nomen dubium	Strand 1907a	S	m	(2) (6)
<i>Asagena violacea</i>	<i>Steatoda violacea</i> (Strand, 1906) nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Lithyphantes bradyi</i>	<i>Steatoda bradyi</i> (Strand, 1907) nomen dubium	Strand 1907a	L	f	(1)
<i>Lithyphantes lenzi</i>	<i>Steatoda lenzi</i> (Strand, 1907) nomen dubium	Strand 1907a	L	m	(1)
<i>Phoroncidia quadrispinella</i>	<i>Phoroncidia quadrispinella</i> Strand, 1907 nomen dubium	Strand 1907c	L	f	(1)
<i>Theridium caplandense</i>	<i>Theridion caplandense</i> Strand, 1907 nomen dubium	Strand 1907a	L	j	(1)
<i>Theridium darolense</i>	<i>Theridion darolense</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Theridium lamperti</i>	<i>Theridion lamperti</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Theridium lenzianum</i>	<i>Theridion lenzianum</i> Strand, 1907 nomen dubium	Strand 1907a	L	m	(1)
<i>Theridium piliphilum</i>	<i>Theridion piliphilum</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<i>Theridium vossi</i>	<i>Theridion vossi</i> Strand, 1907 nomen dubium	Strand 1907a	L	f	(1)
<i>Theridula theriella</i>	<i>Theridula theriella</i> Strand, 1907 nomen dubium	Strand 1907c	L	f	(1)
<b>Thomisidae</b>					
<i>Oxyptila aculeipes</i>	<i>Oxyptila aculeipes</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Runcinia longipes</i>	<i>Runcinia longipes</i> Strand, 1906 nomen dubium	Strand 1906a	S	j	(2) (6)
<i>Runcinia oculifrons</i>	<i>Runcinia oculifrons</i> Strand, 1907 nomen dubium	Strand 1907c	L	m	(1)
<i>Thomisus nossibeensis</i>	<i>Thomisus nossibeensis</i> Strand, 1907 nomen dubium	Strand 1907c	L	f	(1)
<b>Viridasiidae</b>					
<i>Vulsor quartus</i>	<i>Vulsor quartus</i> Strand, 1907 nomen dubium	Strand 1907c	L	f	(1)
<i>Vulsor quintus</i>	<i>Vulsor quintus</i> Strand, 1907 nomen dubium	Strand 1907c	L	f	(1)
<b>Zodariidae</b>					
<i>Laches vittatus</i>	<i>Lachesana vittata</i> (Strand, 1906) nomen dubium	Strand 1906a	S	m	(2) (6)
<i>Mallinella maculata</i>	<i>Mallinella maculata</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)
<i>Mallinella scutata</i>	<i>Mallinella scutata</i> Strand, 1906 nomen dubium	Strand 1906a	S	m	(2) (6)
<i>Mallinus defectus</i>	<i>Mallinus defectus</i> Strand, 1906 nomen dubium	Strand 1906a	S	m	(2) (6)
<i>Zodarium dubium</i>	<i>Zodarion dubium</i> Strand, 1906 nomen dubium	Strand 1906a	S	f	(2) (6)

*Palystes modificus minor* was described by Strand (1906c: 41) as „var. *minor*“. This must have been overlooked by other taxonomists because none of the arachnological catalogues had ever listed this taxon. The male type was deposited in the museum Wiesbaden and was destroyed (Jäger 1998). Following the logic of this publication, we should also declare it a nomen dubium. From the description it becomes clear that Strand actually considered it conspecific with another species he described (*Palystes modificus*): „Ein zweites Exemplar, das wohl derselben Art angehört...“ [A second specimen that belongs apparently to the same species...]. Moreover, he admitted that the difference in body size he recognized between the nominal form and his variety also occurs in *P. superciliosus* L. Koch, 1875, the species which was recognised by Croeser (1996: 56) as senior synonym of *P. modificus*. Therefore, we propose *Palystes modificus minor* Strand, 1906 as a junior synonym of *P. superciliosus* L. Koch, 1875 **syn. nov.**

Five genera become now also **nomina dubia** because they do not include valid species any more (see Tab. 1: comments (8) and (9)). Four of them are monotypic (*Carteroniella*, Strand 1907a: 543; *Eurypelmella*, Strand 1907e: 51; *Thianella*, Strand 1907e: 448; *Tmeticides*, Strand 1907c: 729) and one is ditypic (*Theumella*, Strand 1906a: 608).

## Discussion

A declaration as a nomen dubium on the basis of the above listed argumentation is in line with the decision of many other

researchers who came in the past to the same conclusion with respect to Strand's species. Concerning *Eurypelmella masculina*, Gabriel (2016: 86) opposed a transfer to *Schizopelma*, as proposed by Raven (1985: 153), because Strand's insufficient description would not allow this. For *Mallinus defectus*, Haddad et al. (2019: 157) wrote “The description of the species by Strand ... does not provide a single clue as to the real identity” and Jäger (2014: 184) concluded for *Torania/Barylestis manni* that “the identity of this species remains unsolved”. All three examples concern species listed in Table 1.

Generally, other arachnologists used the fact that the type material was lost or destroyed as a very strong argument to declare a species as a nomen dubium, often in combination with the weak descriptions of Strand and the unavailability of further specimens. For example, Benoit (1968: 141) mentioned that *Selenops modestellus* Strand, 1907 was “détruite durant la guerre ... et décrite de façon insuffisante” [destroyed during the war ... and described in an insufficient manner]; Blandin (1975: 384) wrote for *Perenethis brevipes* (Strand, 1906) that “la description originale ne permet pas de se faire une idée correcte de cette espèce” [the original description does not allow to identify this species correctly]; Russell-Smith (1982: 91) similarly concluded for *Trabaeops bidentigera* Strand, 1906 that “the type ... was destroyed ... and Strand's description is insufficient to identify the species”. “The female syntypes are lost and the type locality (‘Central Australia’) is unknown” wrote Rix et al. (2017: 585) for *Can-*



*tuarides exsiccatus* Strand, 1907 and concluded on nomen dubium. FitzPatrick (2007: 98) came to a similar conclusion for nine *Zelotes* species described by Strand because “type material [was] lost or destroyed and the taxa are not recognisable from the original descriptions”, and Fukushima & Bertani (2017: 129) simply argued “type considered lost” and declared three species and one subspecies of *Avicularia* as nomina dubia. When Raven (1985: 113) synonymized the genus *Nossibe* with *Tigidia*, he only argued “The type of *Nossibe* is lost and was left unplaced by Benoit (1965). Strand (1907a) gave no characters by which *Nossibe* differs from *Tigidia*.”

We can conclude that arachnologists frequently argued in comparable situations in favour of a nomen dubium statement and, meanwhile, such a statement is a kind of routine, also accepted by the World Spider Catalog (2019). It is necessary to underline that such a declaration needs strong guidelines. Unfortunately, the International Code of Zoological Nomenclature (ICZN 2012) does not provide such rules. The term “nomen dubium” does not even occur in the Code, it is only mentioned in its glossary where a nomen dubium is explained as “a name of unknown or doubtful application”. It should also be kept in mind that a nomen dubium declaration is a reversible process, just as the synonymization of two species that can be reversed, for example, within a comprehensive genus revision. The reality, however, shows that this is an extremely rare event, indicating, that the parameters used so far hold. We presented here a set of strong arguments (type material lost, insufficient description, no illustration, never re-collected) and recommend to be as critical as we were here. We are convinced that there are more doubtful species listed in the World Spider Catalog (2019) and such “cleaning-up” may help to release us from taxonomic ballast.

### Recommendation

This unsatisfactory resolution of many taxa described by Embrink Strand provides a few lessons that are still valuable today and allow us to express three recommendations.

- (1) Type material has to be described as completely and carefully as possible. Fortunately, standards today are much higher than at Strand’s time. He delivered sometimes long descriptions but often descriptions of the differences to similar species are missing. Illustrations and/or photos are today state of the art.
- (2) Even today, a museum can burn down, as two recent incidents from Brazil showed us. To prevent similar total losses in future, we recommend that authors provide sound descriptions of both sexes based on all the available specimens, and, whenever possible, to deposit the type material in more than one institution (ideally in four to five), and never in private collections, as these unfortunately are often not curated after the collector’s death and therefore are even more prone to loss or ruin.
- (3) At least for their type material, museums should provide electronic lists and maintain databases of their possessions (see also ICZN 2012: recommendation 72F). This allows us to know what they lost and to declare neotypes, if this is required (ICZN 2012: article 75).

### Acknowledgements

We thank Jason Dunlop (Museum für Naturkunde Berlin), Susanne Fütting (Museum für Natur und Umwelt Lübeck), Fritz Geller-Grimm

(Museum Wiesbaden), Franz Renner (formerly Staatliches Museum für Naturkunde Stuttgart) and Erich Weber (Museum der Universität Tübingen) for the helpful information they gave us, as well as three reviewers and the editors for their valuable comments.

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