

Checklist of Maltese Collembola with nomenclatural notes and new synonyms

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Abstract

Maltese Collembola records are reviewed and a checklist is provided. In a critical examination of previous publications considering Maltese Collembola, several nomenclatural issues were uncovered. Based on these, the following nomenclatural changes are proposed: *Dicyrtoma dorsosignata* Stach, 1924 stat. nov., with the following combinations as synonyms: *D. fusca* var. *dorsosignata* Stach, 1924 syn. nov.; *D. fusca* var. *pallida* Stach, 1924 syn. nov.; *D. fusca* f. *strigata* Stach, 1924 syn. nov.; *D. melitensis* Stach, 1957 syn. nov.; *D. melitensis* var. *dorsosignata* Stach, 1957 syn. nov.; *D. melitensis* var. *pallida* Stach, 1957 syn. nov. and *D. melitensis* Stach, 1967 syn. nov.. *Entomobrya abrupta* (Stach, 1924) stat. nov. with the synonym *E. melitensis* Stach, 1963 syn. nov. The following nomina nuda can be considered *lapsus calami*: *Hypogastrura melitensis* Stach, 1967 is a *nomen nudum* and refers to *H. varians* Stach, 1967. *Triacanthella transilvatica* Stach, 1967 is *nomen nudum* and refers to *T. terrasilvatica* Salmon, 1943. *T. perfusa* Stach, 1967 is *nomen nudum* and refers to *T. purpurea* Salmon, 1943.

Keywords Mediterranean | Malta | *nomen nudum* | faunistics | endemic

1. Introduction

The fauna of the Maltese Islands is peculiar due to its small, yet diverse habitats, its geographical setting in the centre of the Mediterranean Sea, and its threatened wildlife and natural habitats (Schembri 2003, Sciberras & Sciberras 2010, Salvi et al. 2014). Maltese soil fauna has received very limited attention and the majority of works focussed on Collembola, mainly in the middle of the 20th century. Only a few endemic species have been described from the islands. The Maltese Archipelago faced recurrent transient connections to the European mainland during Glacial Maximum periods, and the high number of species shared with Sicily or the Aeolian Archipelago and consequent low number of endemics may be accounted for these episodes (Pedley 2002, Salvi et al. 2014).

1.1. Historical overview of Maltese Collembola studies

The springtails of the Maltese islands were first studied by Stach (1924, 1947, 1949, 1957, 1960, 1963, 1967) who described the species *Dicyrtoma melitensis* Stach, 1957; *Entomobrya albida* Stach, 1963; *Entomobrya melitensis* Stach, 1963; *Heteromurus melitensis* Stach, 1924; *Hypogastura varians* Stach, 1967; *Orchesella melitensis* Stach, 1960; *Protanura mediterranea* Stach, 1967; *Sminthurus gattoi* Stach, 1967 and *Triacanthella biroi* Stach, 1924 as possible endemics and recorded some other, non-endemic species. He also provided a checklist of Maltese Collembola with altogether 30 species (Stach 1967). However, not all his species are currently recognized, and also, some of them proved to be non-endemic by later studies. *E. albida* has been synonymized with *E. schoetti* by Jordana (2012). *H. melitensis* is now regarded as a junior synonym of *H. major* by Handschin (1942) and

Gisin (1960). *P. mediterranea* is now synonymized with *P. pseudomuscorum* by Dallai (1973). *H. varians* has been transferred to the *Ceratophysella* genus and *S. gattoi* to *Spatulosminthurus*. The species *C. varians*, *D. melitensis*, *S. gattoi* and *T. biroii* are still valid species that have been found elsewhere in Europe since they were described from the Maltese Islands (Deharveng & Fjellberg 2013). The species *D. melitensis*, however, is also interesting because Stach's earlier work (1924) has actually described it as variation *dorsosignata* of *D. fusca*, raising nomenclatural issues. Similarly, in the description of *E. melitensis*, the name was applied to type specimens that have already been coined *E. nivalis* var. *abrupta* decades before by Stach himself. These issues are explained in the Results section. Additionally, the record of *Isotomurus maculatus* (Schäffer, 1896) by Stach (1924) originally published as *Isotomurus palustris* var. *maculata* [sic] are questionable as his drawn specimens lack the diagnostic broad middorsal longitudinal spotty stripe of the species. The records from 1924 may represent a different species closely related to *I. maculatus*. Later, Stach (1967) also recorded typical specimens of *I. maculatus* from Malta. Another issue of Stach's Maltese Collembola are specimens of *Hypogastrura aequopilosa* (Stach, 1949), originally described in the genus *Neogastrura*. Stach 1967 (p. 395) referred to specimens of *H. aequopilosa* from Malta. He considered his *H. tullbergi* specimens from Malta identical to descriptions of *H. elegantula* Butschek, 1948 and *H. aequopilosa* but different from *H. boldorii* Denis, 1931. However, the presence of *H. tullbergi* in the Mediterranean is highly unlikely based on that it is considered a true Arctic species in newer literature (Fjellberg 1998). Consequently, the specimens of Stach may in fact represent *H. aequopilosa*, but without a thorough examination of specimens collected from Malta this question can not be settled. We thus tentatively represent this record as *H. cf. aequopilosa* in our checklist. Two *Seira* spp. that were recorded by Stach (1967) from Malta are also problematic: *Seira ferrarii* Parona, 1888 and *Seira italica* (Cassagnau & Delamare Deboutteville, 1953). Stach's illustrations and descriptions of Maltese specimens raise some questions about the identity of both species. Stach examined altogether three *S. ferrarii* specimens and concluded that they are in concordance with the chaetotaxy of the specimens of Yosii (1959) from Madrid. However, comparing the two descriptions reveals that Stach's specimens are much paler and have a different colour pattern and possess a less developed chaetotaxy and shorter antennae. Stach's specimens were thus likely subadults. Later Dallai & Ferrari (1971) redescribed *S. ferrarii* studying extensive topotypical material and stated that the species is quite variable in colour and also rendered *S. italica* a junior synonym of

S. ferrarii. Stach (1967) treated this species separately and gave a more detailed description than the species' original one, but without examining specimens from the type location of *S. italica*. The specimens recorded by him were likely adult and darker coloured *S. ferrarii* specimens.

Collembola records from Malta have been scarce after the works of Stach. Handschin (1942) mentioned *Dicyrtomina minuta-ornata* [sic], *Isotomurus balteatus* (Reuter, 1876) [as *Isotomurus palustris* var. *balteata* (sic)], *Seira incerta* (Handschin, 1925), *Seira squamoornata* (Stscherbakow, 1898) and *Sminthurus viridis* (Linnaeus, 1758) from Malta, but these records were represented in a column titled 'Greece + Malta' in his table, thus should in fact be applicable to Greece but not to Malta. Indeed, no record of these species apart from *S. viridis* have ever been published from Malta [according to Salmon (1964) and Stach's publications]. These records are to be deleted for the Maltese fauna. These misleading records have led for example Poinot (1972) and Ellis (1974) to treat *I. balteatus* as a species present in Malta.

Thibaud & Christian (1989) studied interstitial Collembola from dune sand habitats on Gozo Island of the Maltese Archipelago and described *Odontellina sexoculata* Thibaud & Christian, 1989 and *Mesaphorura schembrii* Thibaud & Christian, 1989 as possible Maltese endemics and recorded several other species for the country. Since then, the tullbergiid *M. schembrii* has been also found in Albania and Morocco (Thibaud 2007).

Literature on Maltese Collembola was surveyed in this work with special emphasis on nomenclatural issues and dubious records and a checklist with currently valid names was compiled. The nomenclature of Collembola is based on Bellinger et al. (1996–2016).

2. Results

2.1. The taxonomic status of *Dicyrtoma melitensis*

During the review of Collembola literature dealing with Malta, it was found that the status of the species *D. melitensis* originally described by Stach (1957) needs to be re-evaluated. In his first work dealing with the Maltese Collembola (Stach 1924), he described records of *D. fusca* (Lubbock, 1873), partly of its nominate form (forma *principalis*), and partly of two new dorsally striped variants (var. *dorsosignata* and var. *pallida*). The latter var. *pallida* is very pale, but otherwise identical to var. *dorsosignata*, questioning its status as a variant or infravariant. Later Stach (1957) elevated the striped

Maltese forms to species level as *D. melitensis*, and transferred the var. *dorsosignata* and var. *pallida* to this new species, not discussing the forma *principalis* of his earlier work. As such Stach lowered *Dicyrtoma fusca* var. *dorsosignata* Stach, 1924 effectively to synonymy with *Dicyrtoma melitensis* var. *dorsosignata* Stach, 1957 and *Dicyrtoma fusca* var. *pallida* Stach, 1924 to synonymy with *Dicyrtoma melitensis* var. *pallida* Stach, 1957. It is noted that the description (p. 73) and drawing (Plate V. Fig. 1.) of *D. melitensis* Stach, 1957 are the copied versions of those of *D. fusca* var. *dorsosignata* Stach, 1924. Thus, according to the Principle of Priority, ICZN rules require the new status of the *Dicyrtoma dorsosignata* Stach, 1924 stat. nov., published earlier, leaving the following combinations as synonyms: *Dicyrtoma fusca* var. *dorsosignata* Stach, 1924: 125 syn. nov.; *Dicyrtoma fusca* var. *pallida* Stach, 1924: 125–126 syn. nov.; *Dicyrtoma fusca* f. *strigata* Stach, 1924: 124 [originally as *strigatus* (sic)] syn. nov.; *Dicyrtoma melitensis* Stach, 1957: 73 syn. nov.; *Dicyrtoma melitensis* var. *dorsosignata* Stach, 1957: 73 syn. nov.; *Dicyrtoma melitensis* var. *pallida* Stach, 1957: 73 syn. nov. and *Dicyrtoma melitensis* Stach, 1967: 415 syn. nov.

2.2. The taxonomic status of *Entomobrya melitensis*

When Stach described *E. melitensis* in 1963 he sunk *E. nivalis* var. *abrupta* Stach, 1924 to synonymy with the new name. No other specimens have been found since 1925, as stated in Stach (1967) and Stach used the types of var. *abrupta* to describe *E. melitensis*. According to the ICZN priority ruling, *E. melitensis* Stach, 1963 syn. nov. should be sunk to synonymy with *E. abrupta* (Stach, 1924) stat. nov.

2.3. Other Collembola species described by Stach

Some additional nomenclatural issues of Maltese Collembola have been uncovered in the species descriptions of Stach. *Hypogastrura varians*: this species was described in Stach (1967), but the author erroneously referred to it as *Hypogastrura melitensis* on p. 394 while, in the same work, he only described *H. varians*. *H. melitensis* is therefore a *lapsus calami* that refers to *Hypogastura varians* Stach, 1967, and that species has been transferred respectively to the subgenus *Hypogastrura* (*Ceratophysella*) by Bourgeois & Cassagnau (1973) and later to the genus *Ceratophysella* by Dallai et al. (1995).

Seira saxatilis Gisin & da Gama, 1962: Stach (1967) referred to this species as *S. saxatilis* in the discussion of *S. dollfusi*, an incorrect subsequent spelling.

Orchesella melitensis: Stach (1960) [not in 1963 as mentioned erroneously in Stach (1967) (p.404)] coined *O. melitensis* for Maltese specimens collected in 1925–1926. In the caption of Plate XV Fig. 6–8 Stach misspelled the new name as *Orchesella melitesis* [sic]. *Orchesella melitesis* Stach, 1960 is thus an incorrect subsequent spelling of *O. melitensis* Stach, 1960.

Triacanthella spp: In the abstract of his work, Stach (1967) made a misspelling of *T. biroi* (which he actually first described as *Triacanthella Birói* [sic], an incorrect original spelling) as *Tricanthella biroi* [sic], an incorrect subsequent spelling. Other, non-Maltese *Triacanthella* species, which he compares *T. biroi* to, raise more nomenclatural issues. *Triacanthella transilvatica* Stach, 1967: 398 is a *lapsus calami* for *T. terrasilvatica* Salmon, 1943. *Triacanthella perfusa* Stach, 1967:398 is a *lapsus calami* for *T. purpurea* Salmon, 1943. *Triacanthella serenseni* Stach, 1967: 398 is an incorrect subsequent spelling of *T. sorenseni* Salmon, 1949.

3. Check list

The valid species recorded from the Maltese Archipelago according to current nomenclature are listed below. The species belonging to several genera (*Entomobrya*, *Pseudosinella*, *Lepidocyrtus*, *Metaphorura*) were recorded and identified before recent revisions, thus the knowledge on Maltese Collembola would greatly benefit from new collecting efforts and updated identifications.

Of the altogether 44 valid Collembola species already recorded from Malta, only *Entomobrya melitensis*, *Odontellina sexoculata*, and *Orchesella melitensis* can be considered endemic according to present knowledge. Most other species of the Maltese Collembola fauna are wide-spread ones distributed across the Mediterranean and/or Europe.

Bourletiellidae

1. *Deuterostminthurus pallipes* (Bourlet, 1843) f. *repandus*
Record originally published as *D. repandus*, a junior synonym. Reference: Stach (1967).

Cyphoderidae

2. *Cyphoderus albinus* Nicolet, 1842
Reference: Stach (1967).

Dicyrtomidae

3. *Dicyrtoma fusca* (Lubbock, 1873)
Record originally published as *D. fusca* forma *principalis*. Reference: Stach (1924).
4. *Dicyrtoma dorsosignata* Stach, 1924 stat. nov.
Described from Malta, but not endemic. Record originally published as *D. fusca* var. *dorsosignata* Stach, 1924. Reference: Stach (1924, 1957, 1967).

Entomobryidae

5. *Entomobrya abrupta* (Stach, 1924) stat. nov.
Record originally published as *E. nivalis* var. *abrupta* Stach, 1924. Likely endemic. Never again found since 1925. Reference: Stach (1924, 1963, 1967).
6. *Entomobrya lanuginosa* (Nicolet, 1841)
Also recorded as *E. lanuginosa* f. *maritima*, a junior synonym. Reference: Stach (1924, 1967).
7. *Entomobrya marginata* (Tullberg, 1871)
Reference: Stach (1967).
8. *Entomobrya nivalis* (Linnaeus, 1758)
Reference: Stach (1967).
9. *Entomobrya schoetti* Stach, 1922
Record originally published as *E. albida* Stach, 1963, a junior synonym. Reference: Stach (1963, 1967).
10. *Heteromurus major* (Moniez, 1889)
Also recorded as *H. melitensis*, a junior synonym. Reference: Stach (1924, 1967), Handschin (1942).
11. *Lepidocyrtus curvicollis* Bourlet, 1839
Reference: Stach (1967).
12. *Lepidocyrtus lanuginosus* (Gmelin, 1788)
Reference: Stach (1967).
13. *Lepidocyrtus paradoxus* Uzel, 1890
Reference: Stach (1967).
14. *Orchesella melitensis* Stach, 1960
Endemic. Never found again since 1960. Reference: Stach (1960, 1967).
15. *Pseudosinella alba* (Packard, 1873)
Reference: Stach (1967).
16. *Seira dollfusi* (Carl, 1899)
Reference: Stach (1967).
17. *Seira domestica* (Nicolet, 1842)
Reference: Stach (1967).
18. *Seira ferrarii* Parona, 1888
Also recorded as *S. italica*, a junior synonym. Reference: Stach (1967).
19. *Seira incolorata* (Wahlgren, 1906)
Record originally published as *S. dollfusi* f. *pallens*, a junior synonym. Reference: Stach (1967).
20. *Willowsia nigromaculata* (Lubbock, 1873)
Reference: Stach (1967).

Hypogastruridae

21. *Acherontiella bougisi* Cassagnau & Delamare, 1955
Reference: Dallai (1978).
22. *Ceratophysella varians* (Stach, 1967)
Described from Malta, but not endemic. Reference: Stach (1967).
23. *Hypogastrura* cf. *aequepilosa* (Stach, 1949)
Originally recorded as *H. tullbergi* (Schäffer, 1900), see Introduction. Reference: Stach (1967).
24. *Triacanthella biroi* Stach, 1924
Described from Malta, but not endemic. Originally spelled *T. Biroi* [sic]. Reference: Stach (1924, 1967).
25. *Xenylla maritima* Tullberg, 1869
Reference: Stach (1967).

Isotomidae

26. *Hemisotoma thermophila* (Axelson, 1900)
Record originally published as *Cryptopygus thermophilus*, a junior synonym. Reference: Thibaud & Christian (1989).
27. *Isotoma viridis* Bourlet, 1839
Reference: Stach (1947).
28. *Isotomiella minor* (Schäffer, 1896)
Reference: Stach (1947).
29. *Isotomodes productus* (Axelson 1906)
Reference: Thibaud & Christian (1989).
30. *Isotomurus maculatus* (Schäffer, 1896)
Record originally published as *I. palustris* f. *maculata* [sic]. Reference: Stach (1967).
31. *Isotomurus palustris* (Müller, 1776)
Reference: Stach (1947, 1967).
32. *Isotomurus* cf. *maculatus* (Schäffer, 1896)
Record originally published as *I. palustris* var. *maculata* [sic]. Reference: Stach (1924).
33. *Parisotoma notabilis* (Schäffer, 1896)
Reference: Stach (1967).

Neanuridae

34. *Anurida maritima* (Guérin-Méneville, 1836)
Reference: Stach (1967).
35. *Friesea mirabilis* (Tullberg, 1871)
Reference: Thibaud & Christian (1989).
36. *Friesea oligorhopala* Caroli, 1914
Reference: Stach (1949, 1967).
37. *Micranurida meridionalis* Cassagnau, 1952
Reference: Thibaud & Christian (1989).
38. *Protanura pseudomuscorum* (Börner, 1903)
Originally recorded as *P. mediterranea* Stach, 1967, a junior synonym. Reference: Stach (1967).

Odontellidae

39. *Odontellina sexoculata* Thibaud & Christian, 1989
Endemic. Reference: Thibaud & Christian (1989).

Sminthuridae

40. *Spatulosminthurus gattoi* (Stach, 1967)
Originally described as *Sminthurus gattoi*. Described from Malta, but not endemic. Reference: Stach (1967).
41. *Sminthurus viridis* (Linnaeus, 1758)
Reference: Stach (1967).

Tullbergiidae

42. *Mesaphorura macrochaeta* Rusek, 1976
Reference: Thibaud & Christian (1989).
43. *Mesaphorura schembrii* Thibaud & Christian, 1989
Described from Malta, but not endemic. Reference: Thibaud & Christian (1989).
44. *Metaphorura affinis* (Börner, 1903)
Reference: Thibaud & Christian (1989).

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5. References

- Bellinger, P. F., K.A. Christiansen & F. Janssens (1996–2016): Checklist of the Collembola of the World [http://www.collembola.org]
- Bourgeois, A. & P. Cassagnau (1973): Les perturbations morphogénétiques de type épitoque chez les Collemboles Hypogastruridae. – Comptes rendus hebdomadaires des séances de l'Académie des sciences (Paris) **277**: 1197–1200.
- Dallai, R. (1973): Ricerche sui Collemboli. XVII. Le Isole Eolie. – Lavori della Società Italiana di Biogeografia, Nuova Serie **3**: 481–590.
- Dallai, R. (1978): Ricerche sui Collemboli. XXIII. Una nuova species cavernicola della Sicilia (*Acherontiella carusoi* n. sp.). – Animalia **5** (113): 345–355.
- Dallai, R. & R. Ferrari (1971): Ricerche sui Collemboli VIII. Ridescrizione di *Seira ferrarii* Parona. – Redia **52**: 131–137.
- Dallai, R., E. Malatesta & P. Ramellini (1995): Apterygota: Collembola, Protura, Microcoryphia e Zygentoma (= Thysanura s.l.), Diplura. – In: Minelli, A., S. Ruffo & S. La Posta (eds): Checklist delle specie della fauna italiana. – Edizioni Calderini, Bologna, Italy: 25 pp.
- Deharveng, L. & A. Fjellberg (2013): Collembola. Fauna Europaea version 2.6.2. [http://www.faunaeur.org/]
- Ellis, W.N. (1974): The spring fauna of Collembola (Insecta) from Rhodos, with descriptions of some new taxa. – Beaufortia **22** (292): 105–152.
- Fjellberg, A. (1998): The Collembola of Fennoscandia and Denmark, Part I: Poduromorpha. – Fauna Entomologica Scandinavica **35**: 1–184.
- Gisin, H. (1960): Collembolenfauna Europas. – Museum d'Histoire Naturelle, Genève, Switzerland: 312 pp.
- Handschin, E. (1942): Collembolen aus Palästina, nebst einem Beitrag zur Revision der Gattung *Cyphoderus*. – Revue Suisse de Zoologie **49**: 401–450.
- Jordana, R. (2012): Synopses on Palaearctic Collembola, Volume 7, Part 1: Capbryinae & Entomobryini. – Soil Organisms **84** (1): 1–390.
- Pedley M., M. Hughes Clarke & P. Galea (2002): Limestone Isles in a Crystal Sea: The Geology of the Maltese Islands. – Publishers Enterprises Group, San Gwann, Malta: 109 pp.
- Poinsot, N. (1972): Étude systématique et écologique des Collemboles Isotomidae de Provence. – Annales de la Société Entomologique de France **8** (3): 669–691.
- Salmon, J. T. (1964): An index to the Collembola. Volume 2. – Royal Society of New Zealand, Bulletin No.7: 145–644.
- Salvi, D., P. J. Schembri, A. Sciberras & D. J. Harris (2014): Evolutionary history of the Maltese wall lizard *Podarcis filfolensis*: insights on the 'Expansion–Contraction' model of Pleistocene biogeography. – Molecular Ecology **23**: 1167–1187.
- Schembri, P. J. (2003): Current state of knowledge of the Maltese non-marine fauna. – In: Anonymous: Malta Environment and Planning Authority Annual report and accounts 2003. – Malta Environment and Planning Authority, Floriana, Malta: 36–65.
- Sciberras, J. & A. Sciberras (2010): Topography and flora of the satellite islets surrounding the Maltese Archipelago. – The Central Mediterranean Naturalist **5** (2): 31–42.
- Stach, J. (1924): Eine alte Reliktenform in der heutigen Apterygoten-Fauna von Malta, zugleich über einige Collembolen von dieser Insel und aus Tunis. – Annales historico-naturales Musei nationalis hungarici **21**: 105–130.
- Stach, J. (1947): The Apterygotan fauna of Poland in relation to the world-fauna of this group of insects. Family Isotomidae. – Panstwowe, Kraków, Poland: 488 pp.
- Stach, J. (1949): The Apterygotan fauna of Poland in relation to the world-fauna of this group of insects. Families: Anuridae and Pseudarchorutidae. – Panstwowe, Kraków, Poland: 122 pp.
- Stach, J. (1957): The Apterygotan fauna of Poland in relation to the world-fauna of this group of insects. Families: Neelidae and Dicyrtomidae. – Panstwowe, Kraków, Poland: 117 pp.
- Stach, J. (1960): The Apterygotan fauna of Poland in relation to the world-fauna of this group of insects. Tribe: Orchesellini. – Panstwowe, Kraków, Poland: 151 pp.

- Stach, J. (1963): The Apterygotan fauna of Poland in relation to the world-fauna of this group of insects. Tribe: Entomobryini. – Panstwowe, Kraków, Poland: 126 pp.
- Stach, J. (1967): Collembola fauna of Malta. – Acta Zoologica Cracoviensia **12** (15): 393–418.
- Thibaud, J.-M. (2007): Recent advances and synthesis in biodiversity and biogeography of arenicolous Collembola. – Annales de la Société Entomologique de France **43** (2): 181–185.
- Thibaud, J.-M. & E. Christian (1989): Collemboles interstitiels aériens des sables littoraux méditerranéens. – Annales de la Société Entomologique de France **25** (1): 71–81.
- Yosii, R. (1959): Collembolan fauna of the Cape province, with special reference to the Genus *Seira* Lubbock. – Special publications from the Seto Marine Biological Laboratory **1** (6): 1–24.