

COLLEMBOLA FROM THE AZORES AND MADEIRA, COLLECTED BY THE LUND UNIVERSITY EXPEDITION IN 1957

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Introduction

The present report deals with the material of Collembola collected during a Lund University Expedition in 1957 to the Azores and Madeira, by Dr. and Mrs. Per Brinck and Dr. and Mrs. Erik Dahl. From late February to the middle of April 1957, the expedition investigated six of nine islands of the Azores, viz. Santa Maria, São Miguel, Terceira, Pico, Faial and Flores; at the end of April 1957 the main island of Madeira was visited.

I. Previous work on the Collembola of the Azores and Madeira

From the Azores only eleven species of Collembola have previously been recorded: *Smythurus fuscus* L. (= *Allacma fusca* [L.]), *Macrotoma tridentifera* Tullb. (= *Tomocerus minor* [Lubb.]), *Templetonia major* Moniez (= *Heteromurus major* [Moniez]), ? *Lepidocyrtus lanuginosus* Gmel. (= ? a young *Entomobrya*), *Isotoma tullbergi* Moniez (= *Isotomurus palustris* [O. F. Müll.]), *Entomobrya multifasciata* Tullb. (= *E. nivalis* [L.]), *Xenylla humicola* O. Fabr. nom. dub. (= *X. maritima* Tullb.), ? *Anurophorus* sp. (= ? *Uzelia setifera* Abs.), *Lipura agilis* Moniez (= *Onychiurus ambulans* [Nic.]), *Lipura bipunctata* Moniez nom. dub. (= *Onychiurus ghidinii* Gis. an *O. pseudinermis* Börn.?). All these species were recorded by Moniez (1889). Finally, Stach (1951) mentions *Neanura muscorum* (Templ.) from the Azores.

Our knowledge of the Madeiran Collembola was, on the other hand, relatively advanced when I began to write the present report. Thanks to the work done by Agrell (1939), Delamare Deboutteville and Bassot (1957), Gisin (1958) and Gama (1959), the list of identified Collembola previously recorded from Madeira contained about 60 different species. These are as follows.

1. *Hypogastrura* (*Ceratophysella*) *occidentalis* Gis. — Gisin 1958, Gama 1959.
2. *Xenylla maritima* Tullb. — Gama 1959.
3. *Xenylla xavieri* Gama — Gama 1959.

4. *Friesea mirabilis* (Tullb.) — Gisin 1958, Gama 1959.
5. *Friesea claviseta* Axels. — Gisin 1958, Gama 1959.
6. *Friesea ladeiroi* Gama — Gama 1959.
7. *Brachystomella parvula* (Schäff.) — Gama 1959.
8. *Odontella lamellifera* (Axels.) — Gisin 1958, Gama 1959.
9. *Xenyllodes armatus* Axels. — Gama 1959.
10. *Anurida comellinii* Gis. — Gama 1959.
11. *Micranurida pygmaea* Börn. — Gama 1959.
12. *Pseudachorudina palmiensis* (Börn.) — Gama 1959.
13. *Neanura muscorum* (Templ.) — Agrell 1939, Gama 1959.
14. *Neanura (Lathriopyga) sinistra* Den. — Gisin 1958.
15. *Neanura (Lathriopyga) longiseta* Car. — Gama 1959.
16. *Neanura (Lathriopyga) phlegraea* Car. — Agrell 1939, Gama 1959.
17. *Onychiurus tuberculatus* (Mon.) — Gama 1959.
18. *Onychiurus hortensis* Gis. — Gama 1959.
19. *Onychiurus circulans* Gis. — Gisin 1958, Gama 1959.
20. *Onychiurus ghidinii* Den. — Gisin 1958.
21. *Onychiurus pseudinermis* Börn. — Gama 1959.
22. *Tullbergia (Mesaphorura) krausbaueri* (Börn.) — Gama 1959.
23. *Tullbergia (Mesaphorura) callipygos* Börn. — Gisin 1958, Gama 1959.
24. *Proctostephanus madeirensis* Gama — Gama 1959.
25. *Tetracanthella matthesi* Gama — Gama 1959.
26. *Isotomodes cf. productus* (Axels.) — Gama 1959.
27. *Isotomodes plurisetosus* (Den.) — Gama 1959.
28. *Folsomia multiseta* Stach — Gisin 1958, Gama 1959.
29. *Folsomia candida* Will. — Gisin 1958, Gama 1959.
30. *Proisotoma minuta* (Tullb.) — Gama 1959.
31. *Proisotoma thermophila* (Axels.) — Gama 1959.
32. *Proisotoma coeruleogrisea* (Hammer) — Gama 1959.
33. *Isotomiella minor* (Schäff.) — Gama 1959.
34. *Pseudisotoma sensibilis* (Tullb.) — Agrell 1939, Gisin 1958, Gama 1959.
35. *Isotoma notabilis* Schäff. — Gisin 1958, Gama 1959.
36. *Isotomurus palustris* (O. F. Müll.) — Agrell 1939, Gama 1959.
37. *Isotomurus antennalis* Bagn. — Gama 1959.
38. *Entomobrya nivalis* (L.) — Agrell 1939, Gisin 1958, Gama 1959.
39. *Entomobrya muscorum* (Nic.) — Agrell 1939.
40. *Sinella pulcherrima* Agrell — Agrell 1939.
41. *Lepidocyrtus curvicollis* Bourl. — Agrell 1939, Gama 1959.
42. *Lepidocyrtus paradoxus* Uzel — Gisin 1958, Gama 1959.
43. *Lepidocyrtus lundbladi* Agrell — Agrell 1939, Gama 1959.
44. *Seira domestica* (Nic.) — Gama 1959.
45. *Tomocerus* sp. I — Agrell 1939 ?, Gama 1959.
46. *Tomocerus* sp. II — Agrell 1939 ?, Gama 1959.
47. *Neelus murinus* Fols. — Delamare Deboutteville et Bassot 1957, Gama 1959.
48. *Megalothorax minimus* Will. — Delamare Deboutteville et Bassot 1957, Gisin 1958, Gama 1959.
49. *Sminthurides (Sphaeridia) minimus* (Schött) — Delamare Deboutteville et Bassot 1957, Gama 1959.
50. *Sminthurides* sp. — Gama 1959.
51. *Arrhopalites coecus* (Tullb.) — Gama 1959.
52. *Arrhopalites mauili* Del. et Bassot — Delamare Deboutteville et Bassot 1957.
53. *Arrhopalites* sp. — Gama 1959.
54. *Disparrrhopalites patrizii* (Cass. et Del.) — Delamare Deboutteville et Bassot 1957.
55. *Sminthurinus aureus* (Lubb.) — Agrell 1939, Delamare Deboutteville et Bassot 1957 („*Sminthurinus* cf. *niger*“), Gama 1959 („*Sminthurinus niger* [Lubb.]“ et „*Sminthurinus* cf. *igniceps* [Reut.]“).
56. *Sminthurinus elegans* (Fitch) — Delamare Deboutteville et Bassot 1957, Gama 1959.
57. *Bourletiella arvalis* (Fitch) — Agrell 1939.
58. *Bourletiella (Deuterosminthurus) repanda* (Aagren) — Agrell 1939.

59. *Sminthurus bremondi* Del. et Bassot — Delamare Deboutteville et Bassot 1957.
 60. *Sphyrotheca lubbocki* (Tullb.) — Gama 1959.
 61. *Dicyrtoma minuta* (O. Fabr.) — Agrell 1939, Delamare Deboutteville et Bassot 1957 („*Dicyrtomina* juv.“), Gama 1959.

The above list is, of course, not free from misidentified species which are discussed in the following part of the present paper.

All the material examined has been mounted in polyvinyl alcohol and returned to Lund where it will be deposited in the Entomological Museum of the Zoological Institute.

I am indebted to Professor P. Brinck, Lund, who sent me the rich collection for study, as well as to Dr. L. Hoberlandt, Prague, who agreed to publish the present paper in this journal.

II. Material examined

Family HYPOGASTRURIDAE

***Hypogastrura manubrialis* (Tullberg, 1869)**

Azores, São Miguel: Ponta Delgada, 2 km NE of town, at swimming pool, 3. III. 1957, loc 9, protocol AZ/—/6, AZ/—/9 (2 ex.); ibidem 5. III. 1957, loc. 9, protocol AZ/—/1, AZ/—/4, AZ/—/5, AZ/—/10 (35 ex.); Ponta Delgada, grassy ground, garden, 16. III. 1957, loc. without no., protocol AZ/—/3 (9 ex.); Lagoa do Carvão, freshwater lake, on the shore, 7. III. 1957, loc. 13, protocol AZ/13/3, AZ/13/4 (2 ex.); Relva, at tanque da Rocha Quebrada, 15. III. 1957, loc. 31, protocol AZ/31/3 (11 ex.); ibidem, freshwater pool, 15. III. 1957, loc. 31, protocol AZ/31/2 (3 ex.); Ribeira das tres Voltas, near Ribeira Chã, almost dry spring, 23. III. 1957, loc. 55, protocol AZ/55/1 (1 ex.).

Azores, Faial: Horta, town, 3. IV, 1957, loc. 84, protocol AZ/84/1 (1 ex.).

Azores, Flores: Ribeira d' Alem da Fazenda, river, 14. IV. 1957, loc. 108, protocol AZ/108/3 (3 ex.).

Although cosmopolitan in distribution, the species has not previously been recorded from either Azores or Madeira.

A specimen from the sample AZ/—/1 carries on the left antenna a mature Laboulbeniales.

***Hypogastrura (Ceratophysella) armata* (Nicolet, 1842)**

Azores, São Miguel: Ponta Delgada, 2 km NE of town, swimming pool, 3. III. 1957, loc. 9, protocol AZ/—/9, AZ/—/12 (4 ex.); ibidem, 5. III. 1957, loc. 9, protocol AZ/—/1, AZ/—/4, AZ/—/10, AZ/—/11 (61 ex.); Ponta Delgada, grassy ground, garden, 16. III. 1957, loc. without no., protocol AZ/—/3 (3 ex.); Sete Cidades, at Lagoa Azul, 2. III. 1957, loc. 7, protocol AZ/7/2 (1 ex.); Fonte da Rocha near Relva, 4,5 km W of Ponta Delgada, spring, 5. III. 1957, loc. 11, protocol AZ/11/3 (15 ex.); Lagoa do Carvão, freshwater lake, at shore, 7. III. 1957, loc. 13, protocol AZ/13/1 (2 ex.);

Caldeira das Sete Cidades, at the lake, 8. III. 1957, loc. 18, protocol AZ/18/8 (1 ex.); 3 km W of Porto Formoso, in detritus on a steep near the road, 9. III. 1957, loc. 20, protocol AZ/20/1 (1 ex.); river 5 km SSE of Ribeira Grande, sieved from leaves of Eucalyptus and Hedychium, 14. III. 1957, loc. 29, protocol AZ/29/1 (1 ex.); Relva, at tanque da Rocha Quebrada, 15. III. 1957, loc. 31, protocol AZ/31/3 (1 ex.); ibidem, freshwater pool, 15. III. 1957, loc. 31, protocol AZ/31/1, AZ/31/2 (3 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (39 ex.).

Azores, Santa Maria: Limestone area, on the S. coast, 20. III. 1957, loc. 48, protocol AZ/48/3 (1 ex.).

Azores, Faial: Horta, Ribeira dos Flamengos, under stone in a damp ravine, 31. III. 1957, loc. 71, protocol AZ/71/2 (1 ex.); Fajã, 1.5 km W of Praia do Norte, foerna, in forest, 2. IV. 1957, loc. 78, protocol AZ/78/3 (2 ex.); Ribeira dos Flamengos, 2 km WNW of Flamengos, in drift material in a ravine, 4. IV. 1957, loc. 91, protocol AZ/91/1 (1 ex.).

A cosmopolitan species, the polymorphism of which was described excellently by Gisin (1947, Mitt. schweiz. entomol. Ges. 20:342). Later in 1958, the same author proposed the Madeiran populations to be named *H. (Ceratophysella) occidentalis* Gisin.

A number of Azorean specimens which I investigated in detail with regard to their abdominal microchetotaxy correspond to the type "*occidentalis*", but owing to the known variability of the characters in question I am opposed to classify the form "*occidentalis*" as a distinct species or subspecies.

In addition, the Azorean populations show some colour differences. Thus the examples listed as AZ/7/2, AZ/11/3, partly also AZ/—/3 (3 ex.) and AZ/35/1 (3 ex.); may be identified as f. "*unicolor*"; those listed as AZ/78/3 rather represent f. "*pallens*".

Choreutinula libyca (Caroli, 1914)

Azores, São Miguel: Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (7 ex.).

Weakly pigmented. Almost all the animals have only the ocellar fields pigmented.

The species was previously reported from Libya, France, England and South Africa.

Xenylla maritima Tullberg, 1869

Azores, São Miguel: Ponta Delgada, 2 km NE of town, swimming pool, 5. III. 1957, loc. 9, protocol AZ/—/1 (1 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (3 ex.).

This species was recorded from the Azores under the ambiguous name *X. humicola* by Moniez (1889). Gama (1959) quotes it from Madeira. Another Madeiran species, *X. xavieri* Gama, might be merely a juvenile instar of *X. maritima* Tullb.

Acherontiella bougisi Cassagnau et Delamare, 1955

Azores, Santa Maria: Limestone area, on the S. coast, 20. III. 1957, loc. 48, protocol AZ/48/3 (1 ex.).

Some skin granules on the posterior part of the head, mainly near the ocular region, are remarkably coarse and form areas which may resemble somewhat the ocellar fields, as they seem to be composed each of about 5 elements.

The description of this peculiar species is based on various specimens captured in Lebanon (Beirut; cave at Antélias).

Family NEANURIDAE

Friesea mirabilis (Tullberg, 1871)

Azores, São Miguel: Ponta Delgada, 2 km NE of town, swimming pool, 5. III. 1957, loc. 9, protocol AZ/—/1 (1 ex.).

Gisin (1958) and Gama (1959) have already recorded this widespread species from Madeira.



Fig. 1. — *Odontella lamellifera* (Axels.). Note the chetotaxy of the posterior part of abdomen. Azores, loc. 108, 60X (microscopical magnification).

***Odontella lamellifera* (Axelson, 1903)**

Azores, Flores: Ribeira d' Alam da Fazenda, river, 14. IV. 1957, loc. 108, protocol AZ/108/3 (1 ex.).

The only Azorean specimen measures about 0,9 mm and shows numerous pretty long hairs around the posterior part of the body (fig. 1). Gisin (1958), when examining specimens from Madeira, was surprised to find an agreement in chetotaxy with the type material of Axelson (Linnaniemi). The figure given by Linnaniemi (1912: Pl. 1, Fig. 5) in his monograph of the Finnish Apterygota must, therefore, be inexact.

The species seems to be distributed all over the Mediterranean region. It was recently recorded, by Gama, from Madeira and Portugal.

***Neanura muscorum* (Templeton, 1835)**

Azores, São Miguel: Caldeira das Sete Cidades, in Cryptomeria plantation, 8. III. 1957, loc. 18, protocol AZ/18/10 (1 ex.); Lagoa das Furnas, on a trunk on lake shore, 10. III. 1957, loc. 22, protocol AZ/22/6 (3 ex.).

Azores, Faial: Horta, Ribeira dos Flamengos, under stone in ravine, 31. III. 1957, protocol AZ/71/3 (1 ex.).

A common Holarctic species already recorded from the Azores and Madeira.

***Neanura montana* (Handschin, 1929)**

Azores, São Miguel: Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (1 ex.).

This Ethiopian species has been known hitherto from Abyssinia, Kilimanjaro and South Africa.

***Pseudachorutes subcrassus* Tullberg, 1871**

Azores, São Miguel: Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (1 ex.).

A European species the distribution of which reaches as far as southern Spain and Portugal. It has not previously been recorded from either Azores or Madeira.

Family ONYCHIURIDAE

***Onychiurus ambulans* (Nicolet, 1847)**

Azores, São Miguel: Lagoa do Carvão, freshwater lake, on the shore, 7. III. 1957, loc. 13, protocol AZ/13/1 (1 ex.); Caldeira das Sete Cidades, in Cryptomeria plantation, 8. III. 1957, loc. 18, protocol AZ/18/7 (1 ex.).

Azores, Santa Maria: Pico Alto, alt. 550 m, in vegetation at spring, 19. III. 1957, loc. 42, protocol AZ/42/1 (1 ex.); Praia, under stone at ponds, 20. III. 1957, loc. 47, protocol AZ/47/1 (1 ex.); Limestone area, on the S. coast, 20. III. 1957, loc. 48, protocol AZ/48/3 (1 ex.).

Azores, Faial: Horta, Ribeira dos Flamengos, under stone, 31. III. 1957, loc. 71, protocol AZ/71/1 (1 ex.); 3 km WNW of Pedro Miguel, 5. IV. 1957, loc. 92, protocol AZ/92/1, AZ/92/2 (11 ex.).

Azores, Pico: 1 km S of Areia Larga, under stone, 11. IV. 1957, loc. 107, protocol AZ/107/2 (1 ex.).

Azores, Flores: Ribeira d' Alem da Fazenda, dry grassy ground, 14. IV. 1957, loc. 108, protocol AZ/108/4 (1 ex.).

This species has been mentioned from the Azores by Moniez (1889) under the name *Lipura agilis* Mon. From Madeira the same species was recorded as *Onychiurus circulans* Gis. But, as the number of pseudocelli on the sternite of abd. I varies in *O. ambulans* (Nic.) from 1 + 1 to 3 + 3 (or 4 + 4), *O. circulans* Gis. is merely a form of *O. ambulans* (Nic.).

A specimen from the sample AZ/47/1 shows on thorax I a minute excrescence which is, no doubt, nothing else but a Laboulbeniales.

***Onychiurus ghidinii* Denis, 1938**

Azores, São Miguel: São Populo, 7,5 km E of Ponta Delgada, sandy grassy ground, 1. III. 1957, loc. 3, protocol AZ/3/1 (1 ex.); Sete Cidades, at Lagoa Verde, under the bark of tree stump, 2. III. 1957, loc. 8, protocol AZ/8/2 (1 ex.); Caldeira das Sete Cidades, at freshwater lake, 8. III. 1957, loc. 18, protocol AZ/18/6 (1 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (5 ex.); Caldeira das Sete Cidades, at Lagoa Azul, among lichens on a tree trunk, 21. III. 1957, loc. 50, protocol AZ/50/3 (2 ex.); Caldeira das Sete Cidades, at Lagoa Azul, among stones and leaves in Eucalyptus wood, 21. III. 1957, loc. 50, protocol AZ/50/4 (6 ex.); Caldeira das Sete Cidades, at Lagoa Azul, under stone on the E side of the crater, 21. III. 1957, loc. 50, protocol AZ/50/6 (1 ex.); Caldeira das Sete Cidades, at Lagoa Azul, E side, 21. III. 1957, loc. 51, protocol AZ/51/2 (4 ex.); Caldeira das Sete Cidades, at Lagoa Azul, sieved from leaves of Platanus and Hedychium and from moss on the crater edge, 21. III. 1957, loc. 51, protocol AZ/51/3 (2 ex.); Lagoa das Furnas, under stone on lake shore, 24. III. 1957, loc. 58, protocol AZ/58/1 (19 ex.); 1,5 km S of Maia, in ravine at stream, 25. III. 1957, loc. 62, protocol AZ/62/1 (1 ex.).

Azores, Faial: Horta, Ribeira dos Flamengos, under stone, 31. III. 1957, loc. 71, protocol AZ/71/1 (4 ex.); Porto da Boca da Ribeira, 1 km E of Ribeirinha, under stone, 1. IV. 1957, loc. 74, protocol AZ/74/1 (1 ex.); Baía da Areia das Fontes, 1 km N of Praia do Norte, under stone, 2. IV. 1957, loc. 77, protocol AZ/77/1 (3 ex.); Ribeira dos Flamengos, 2 km WNW of Flamengos, ravine, 4. IV. 1957, loc. 91, protocol AZ/91/1 (1 ex.).

Azores, Pico: 1 km S of Areia Larga, under stone, 11. IV. 1957, loc. 107, protocol AZ/107/2 (1 ex.).

Ma de i ra: Terreiro da Luta, alt. 850 m, stream, 20. IV. 1957, loc. 112, protocol MA/112/1 (1 ex.); 1 km E of Encumeada, alt. about 800 m, 28. IV. 1957, loc. 135, protocol MA/135/1 (1 ex.).

In 1889, Moniez described from the Azores a species of *Onychiurus* which he regarded as new and named erroneously *Lipura bipunctata* Mon. Denis (1923) revised the type material and found it to be identical

with *O. fimetarius* auct. (= *O. pseudinermis* Börn.). In 1958, Gisin mentions from Madeira another closely related species, viz. *O. ghidinii* Den. Gama, in her materials from Madeira and Portugal, found only *O. pseudinermis* Börn. and never *O. ghidinii* Den.

The only difference by which the two species may be distinguished refers to the development of the male ventral organ, a structure which is absent in *O. pseudinermis* Börn. The ventral organ of *O. ghidinii* Den. consists of some sensory setae, but these are hardly recognizable in young specimens.

Although I was unable to find these sensory setae in many males from the Azorean localities, it seems preferable not to split this material into two different taxa. So the specific independence of *O. ghidinii* Den. becomes a matter of supreme incertitude. As in certain other insect species the secondary sexual characters may perhaps be confined to only a part of the polymorphic male (female) generation.

Family ISOTOMIDAE

Proctostephanus madeirensis Gama, 1959

Azores, São Miguel: Ponta Delgada, 2 km NE of town, swimming pool, 5. III. 1957, loc. 9, protocol AZ/—/1 (1 ex.); Ponta Delgada, grassy ground, garden, 16. III. 1957, loc. without no., protocol AZ/—/3 (1 ex.); Fonte da Rocha near Relva, 4,5 km W of Ponta Delgada, spring, 5. III. 1957, loc. 11, protocol AZ/11/2 (1 ex.); Lagoa do Carvão, freshwater lake, on the shore, 7. III. 1957, loc. 13, protocol AZ/13/3 (1 ex.); Relva, at tanque da Rocha Quebrada, freshwater pool, 15. III. 1957, loc. 31, protocol AZ/31/2 (1 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (1 ex.).

Ma de i r a : Arieiro Mts., Ribeira das Cales, alt. 1300 m, 21. IV. 1957, loc. 113, protocol MA/113/2 (1 ex.).

The sclerotized rosette of the abdominal tergite V of the specimens examined is shaped like a corolla (AZ/11/2, AZ/35/1) or a many-pronged star: 9-pronged (AZ/31/2) or 10-pronged star (AZ/13/3). Types intermediate between a corolla and a star are represented in two samples, viz. MA/113/2 (11-pronged star) and AZ/—/1 (12-pronged star).

Reported previously from Madeira and the Iberian peninsula.

Proctostephanus stuckeni Börner, 1902

Azores, Santa Maria: Limestone area, under stone in a lime pit, 20. III. 1957, loc. 48, protocol AZ/48/4 (1 ex.).

The sclerotized rosette of the abdominal tergite V of the specimen examined is shaped like a corolla.

Proctostephanus cidi Selga, 1958, being probably a synonym of *P. stuckeni* Börn., the species occurs, according to our present knowledge, in France, Italy, Sicily, Crete, Spain, Portugal, Azores and Chile.

Tetracanthella matthesi Gama, 1959

Azores, São Miguel: Ribeira das tres Voltas, near Ribeira Chã, almost dry spring, 23. III. 1957, loc. 55, protocol AZ/55/1 (1 ex.).

Azores, Flores: Ribeira d'Alem da Fazenda, river, 14. IV. 1957, loc. 108, protocol AZ/108/3 (1 ex.).

Maximum body length of the specimens examined 1,2 mm. Dark blue, antennae, legs and furca paler. The reticulated portion of skin with polygonal areas which are usually large. Antenna III with two sensory rods and two lateral sensory hairs. Antenna IV subapically with several curved hairs. Eyes, postantennal organ and anal spines as in *T. pilosa*. A stout and long macrochaeta on the femur of each foot, not clavate. Empodium sharply acuminate but without a longer apical bristle at the tip; it does not extend beyond the middle of the claw. Tibiotarsal hairs (1, 2, 2) exactly as in *T. pilosa*. Tenaculum with 1 bristle in corpus and with 3 barbs on each ramus. Furca well developed. Mucro distinctly separated from the dens, bidentate as in *T. pilosa*. Dens with only two setae on the ventral ("dorsal") side line in *T. montana*, and with one seta on the dorsal ("ventral") side, opposite the ventral distal one. Manubrium ventrally ("dorsally") with some pairs of setae, dorsally without setae.

This species is closely related to (perhaps identical with) *Tetracanthella ethelae* Wray, 1945, from North Carolina.

Folsomia candida Willem, 1902

Azores, São Miguel: Lagoa das Furnas, at warm spring, 10. III. 1957, loc. 22, protocol AZ/22/5 (1 ex.).

Azores, Flores: Ribeira d'Alem da Fazenda, at stream, under stone, 14. IV. 1957, loc. 108, protocol AZ/108/2 (1 ex.).

This species was reported from Madeira for the first time by Gisin (1958) who used the name *Folsomia distincta* Bagnall for it. Our specimens possess occasionally an inner tooth on the claws and would correspond, therefore, to the description of *F. kingi* Bagnall. But I perfectly agree with Stach according to whom *F. distincta* Bagn. and *F. kingi* Bagn. are no distinct species but merely unimportant forms of *F. candida* Willem.

Proisotoma thermophila (Axelson, 1900)

Azores, São Miguel: Ponta Delgada, grassy ground, garden, 16. III. 1957, loc. 9, protocol AZ/—/3 (10 ex.); Lagoa do Carvão, freshwater lake, on the shore, 7. III. 1957, loc. 13, protocol AZ/13/4 (2 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (4 ex.).

A widely distributed species and already recorded from Madeira.

Proisotoma minuta (Tullberg, 1871)

Azores, São Miguel: Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (5 ex.).

Cosmopolitan in distribution and already recorded from Madeira.

Proisotoma schötti (Dalla Torre, 1895)

Azores, São Miguel: Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (3 ex.).

Although widely distributed in Europe and Africa, this species has not formerly been reported either from Madeira or the Azores. A cosmopolitan species.

Proisotoma laticauda Folsom, 1937

Azores, São Miguel: Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (1 ex.).

Patria typica: Massachusetts, U. S. A. Our Azorean specimen corresponds exactly to the original description of *P. laticauda* Folsom and may represent the first record of an oversea locality.

Some closely related species have been described from North and Central America, one of which, the Floridan *P. excavata* Folsom, was later found, by Delamare Deboutteville, among material from Kilimanjaro.

Isotomiella minor (Schäffer, 1896)

Azores, Flores: Ribeira d'Alem da Fazenda, at stream, under stone, 14. IV. 1957, loc. 108, protocol AZ/108/2 (1 ex.).

Probably a cosmopolitan species which was already recorded from Madeira.

Pseudisotoma sensibilis (Tullberg, 1876)

Azores, Flores: Ribeira d'Alem da Fazenda, river, 14. IV. 1957, loc. 108, protocol AZ/108/3 (11 ex.).

This Palaearctic species is known to occur commonly in Madeira. It has not been reported formerly from the Azores.

Isotoma notabilis Schäffer, 1896

Azores, São Miguel: River 5 km SSE of Ribeira Grande, sieved from leaves of Eucalyptus and Hedychium, 14. III. 1957, loc. 29, protocol AZ/29/1 (2 ex.).

Azores, Pico: Volc. Pico, W side, alt. about 350 m, in forest, 8. IV. 1957, loc. 99, protocol AZ/99/1 (1 ex.).

A cosmopolitan species, recorded previously from Madeira but not from the Azores.

Isotoma trispinata Mac Gillivray, 1896

Azores, São Miguel: 2 km SW of Porto Formoso, in a stone pit, 11. III. 1957, loc. 25b, protocol AZ/—/2 (1 ex.); 3 km W of Porto Formoso, in detritus on mountain side near the road, 9. III. 1957, loc. 20, protocol AZ/20/1 (28 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (13 ex.).

Azores, Pico: Volc. Pico, W side, alt. about 350 m, in forest, 8. IV. 1957, loc. 99, protocol AZ/99/2 (1 ex.).

Described from the U. S. A. and not reported from other continents.

***Isotoma viridis* Bourlet, 1839**

Azores, São Miguel: Fonte da Rocha near Relva, 4,5 km W of P. Delgata, rock spring, 5. III. 1957, loc. 11, protocol AZ/11/1 (1 ex.).

Azores, Pico: Volc. Pico, W side, alt. 1000—1100 m, Erica bush at snow line, 8. IV. 1957, loc. 95, protocol AZ/95/2 (3 ex.); Volc. Pico, W side, alt. about 800 m, under stone, 8. IV. 1957, loc. 97, protocol AZ/97/1 (1 ex.).

This common Holarctic species has not previously been recorded either from Madeira or the Azores.

One specimen of the sample AZ/95/2 shows a fungus growth in the centre of a body trauma.

***Isotomurus palustris* (O. F. Müller, 1776)**

Azores, São Miguel: Ponta Delgada, 2 km NE of town, swimming pool, 3. III. 1957, loc. 9, protocol AZ/—/6, AZ/—/9 (2 ex.); ibidem, 5. III. 1957, loc. 9, protocol AZ/—/1, AZ/—/4, AZ/—/5, AZ/—/10 (14 ex.); Ponta Delgada, grassy ground, garden, 16. III. 1957, loc. without no., protocol AZ/—/3 (3 ex.); Fonte da Rocha near Relva, 4,5 km W of Ponta Delgada, rock spring, 5. III. 1957, loc. 11, protocol AZ/11/1, AZ/11/2 (5 ex.); Lagoa do Carvão, on shore of freshwater lake, 7. III. 1957, loc. 13, protocol AZ/13/2 (1 ex.); ibidem, freshwater lake, on the shore, 7. III. 1957, loc. 13, protocol AZ/13/1, AZ/13/3, AZ/13/4 (10 ex.); Lagoa das Furnas, at hot spring, 10. III. 1957, loc. 22, protocol AZ/22/2, AZ/22/3, AZ/22/5 (3 ex.); ibidem, among drift material, 10. III. 1957, loc. 22, protocol AZ/22/4 (9 ex.); Caldeiras, 5 km SE of Ribeira Grande, under stone, 14. III. 1957, loc. 28, protocol AZ/28/2 (1 ex.); river 5 km SSE of Ribeira Grande, sieved from leaves of Eucalyptus and Hedychium, 14. III. 1957, loc. 29, protocol AZ/29/1 (5 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (1 ex.); Caldeira das Sete Cidades, at Lagoa Azul, 21. III. 1957, loc. 50, protocol AZ/50/2 (1 ex.); Ribeira das tres Voltas, near Ribeira Chã, almost dry spring, 23. III. 1957, loc. 55, protocol AZ/55/1 (11 ex.).

Azores, Faial: 3 km WNW of Pedro Miguel, 5. IV. 1957, loc. 92, protocol AZ/92/2 (2 ex.); ibidem, freshwater pool, 5. IV. 1957, loc. 92, protocol AZ/92/3 (1 ex.); Nasce Agua, 3 km S of Cedros, under stone, 5. IV. 1957, loc. 93, protocol AZ/93/1 (1 ex.).

Azores, Pico: Volc. Pico, W side, alt. about 800 m, under stone, 8. IV. 1957, loc. 97, protocol AZ/97/4 (1 ex.); ibidem, freshwater pool, 8. IV. 1957, loc. 97, protocol AZ/97/2 (1 ex.).

Azores, Flores: Ribeira d'Alem da Fazenda, river, 14. IV. 1957, loc. 108, protocol AZ/108/3, AZ/108/6 (4 ex.); Central plateau, S and SE of Caldeira Comprida, on sand, 14. IV. 1957, loc. 109, protocol AZ/109/2 (1 ex.); Central plateau, Lagoa Branca, under stone, 14. IV. 1957, loc. 110, protocol AZ/110/1 (1 ex.).

Madeira. Faial, at mouth of Rib. do Faial, under stone, 21. IV. 1957, loc. 116, protocol MA/116/1 (1 ex.); Porto Novo, Rib. do Porto Novo, under stone in a ravine, 22. IV. 1957, loc. 119, protocol MA/119/1 (1 ex.).

Probably a cosmopolitan species which has been reported already from both the Azores and Madeira.

The sample AZ/—/10 includes a specimen infested by gregarines.

Family ENTOMOBRYIDAE

Entomobrya nivalis (Linné, 1758)

Azores, São Miguel: Ponta Delgada, grassy ground, garden, 16. III. 1957, loc. without no., protocol AZ/—/3 (2 ex.); São Populo, 7,5 km E of Ponta Delgada, 3 to 5 m above sea, 20 m from the sea, among vegetation, 12. III. 1957, loc. 26, protocol AZ/26/1 (1 ex.); Ribeira da Praia, 3 km W of Villa Franca do Campo, swept in vegetation, 13. III. 1957, loc. 27, protocol AZ/27/1 (1 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (4 ex.); Lagoa do Fogo, wet heath, swept in vegetation (*Calluna*, *Vaccinium*), 22. III. 1957, loc. 54, protocol AZ/54/5 (1 ex.); Furnas, hot springs, 24. III. 1957, loc. 59, protocol AZ/59/1 (1 ex.).

Azores, Santa Maria: Aeroporto, sandy wet ground, under stone, 19.—20. III. 1957, loc. 44, 45, protocol AZ/44—45/1 (1 ex.).

Azores, Faial: Porto do Salão, on shore, under stone, 1. IV. 1957, loc. 75, protocol AZ/75/1 (1 ex.); Ribeira das Cabras, 1 km NO of Praia do Norte, in *Pittosporum* plantation in a ravine, 2. IV. 1957, loc. 76, protocol AZ/76/1 (1 ex.); Costa da Náu, 3 km NW of Capêlo, ash plain, 4. IV. 1957, loc. 88, protocol AZ/88/2 (1 ex.); pool 1 km ESE of Cabeço do Fogo, 4. IV. 1957, loc. 90, protocol AZ/90/3 (1 ex.).

Azores, Flores: Ribeira d'Alem da Fazenda, at mouth of stream, 14. IV. 1957, loc. 108, protocol AZ/108/1 (1 ex.); ibidem, at stream, under stone, 14. IV. 1957, loc. 108, protocol AZ/108/2 (1 ex.).

Madeira: Arieiro Mts., alt. about 1700 m, river, 21. IV. 1957, loc. 114, protocol MA/114/1 (2 ex.).

This cosmopolitan, much variable in pigmentation pattern, has been mentioned already — mostly under the synonym *E. multifasciata* (Tullb.) — from both the Azores and Madeira.

Sinela höfti Schäffer, 1896

Azores, São Miguel: Caldeiras, 5 km SE of Ribeira Grande, among leaves at spring, 14. III. 1957, loc. 28, protocol AZ/28/6 (5 ex.).

Probably a cosmopolitan. It has not been reported formerly either from the Azores or Madeira.

Heteromurus major (Moniez, 1889)

Azores, São Miguel: Ponta Delgada, 2 km NE of town, swimming pool, 5. III. 1957, loc. 9, protocol AZ/—/1, AZ/—/11 (2 ex.); São Populo, 7,5 km E of Ponta Delgada, sandy grass-covered ground, on beach, 1. III. 1957, loc. 3, protocol AZ/3/2, AZ/3/3, AZ/3/4 (12 ex.); ibidem, grassy ground near rocky shore, 4. III. 1957, loc. 10, protocol AZ/10/1 (1 ex.); Fonte Grande SE Feteiras, at spring, 6. III. 1957, loc. 12, protocol AZ/12/1,

AZ/12/2 (2 ex.); Caldeira das Sete Cidades, on stones on the shore of Lagoa Azul, 8. III. 1957, loc. 18, protocol AZ/18/1 (2 ex.); ibidem, among stones on the shore of a bay of Lagoa Azul, 8. III. 1957, loc. 18, protocol AZ/18/2, AZ/18/3 (2 ex.); ibidem, at the mouth of tunnel, on grassy ground, under stone, 8. III. 1957, loc. 18, protocol AZ/18/4, AZ/18/5 (5 ex.); Lagoa das Furnas, in drift material, 10. III. 1957, loc. 22, protocol AZ/22/4 (1 ex.); ibidem, at hot spring, 10. III. 1957, loc. 22, protocol AZ/22/5 (3 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (1 ex.); Fonte at Casas Telhadas, SW of Rib. Grande, grassy ground, under stone, 18. III. 1957, loc. 36, protocol AZ/36/1, AZ/36/2 (2 ex.); Caldeira das Sete Cidades, at Lagoa Azul, in *Cryptomeria* plantation, 21. III. 1957, loc. 50, protocol AZ/50/1 (1 ex.); ibidem, *Eucalyptus* forest, among stones and leaves, 21. III. 1957, loc. 50, protocol AZ/50/4 (1 ex.); Ribeira das tres Voltas, near Ribeira Chã, almost dry spring, 23. III. 1957, loc. 55, protocol AZ/55/1 (1 ex.); River NW Agua Retorta, under stone, 23. III. 1957, loc. 57, protocol AZ/57/1 (1 ex.); 3 km S of Pico da Pedra, in scrub vegetation, 25. III. 1957, loc. 64, protocol AZ/64/1 (1 ex.).

Azores, Santa Maria: Limestone area, under stone, 20. III. 1957, loc. 48, protocol AZ/48/1, AZ/48/2 (2 ex.).

Azores, Faial: 0.5 km WNW of Ribeirinha, under stone, 1. IV. 1957, loc. 73, protocol AZ/73/1 (2 ex.); Fajã, 2 km W of Praia do Norte, ash field with moss, under stone, 2. IV. 1957, loc. 78, protocol AZ/78/1 (1 ex.); ibidem, under a piece of wood, 2. IV. 1957, loc. 78, protocol AZ/78/2 (1 ex.); Costa da Náú, 3 km NW of Capêlo, *Erica* bush, foerna, 4. IV. 1957, loc. 88, protocol AZ/88/1 (1 ex.); Cabeço do Canto, *Erica* bush, foerna, 4. IV. 1957, loc. 89, protocol AZ/89/1 (3 ex.); Cabeço do Fogo, *Erica* bush, foerna, 4. IV. 1957, loc. 90, protocol AZ/90/2 (2 ex.); Nasce Agua, 3 km S of Cedros, under stone, 5. IV. 1957, loc. 93, protocol AZ/93/1 (3 ex.); Caldeira, under stone, 10. IV. 1957, loc. 105, protocol AZ/105/1 (2 ex.); ibidem, grassy ground, under stone, 10. IV. 1957, loc. 105, protocol AZ/105/2 (2 ex.).

Azores, Pico: Volc. Pico, W side, alt. 1000–1100 m, *Erica* bush at snow line, 8. IV. 1957, loc. 95, protocol AZ/95/1 (1 ex.); Volc. Pico, W side, alt. about 800 m, under stone, 8. IV. 1957, loc. 97, protocol AZ/97/3, AZ/97/4 (3 ex.); Volc. Pico, W side, alt. about 350 m, in forest, 8. IV. 1957, loc. 99, protocol AZ/99/2 (1 ex.); ibidem, grassy ground, under stone, 9. IV. 1957, loc. 100, protocol AZ/100/1 (1 ex.); 1 km S of Areia Larga, under stone, 11. IV. 1957, loc. 107, protocol AZ/107/1, AZ/107/2 (3 ex.).

Azores, Flores: Ribeira d'Alem da Fazenda, at stream, under stone, 14. IV. 1957, loc. 108, protocol AZ/108/2 (3 ex.); ibidem, dry grassy ground, 14. IV. 1957, loc. 108, protocol AZ/108/5 (1 ex.); Central plateau, S and SE of Caldeira Comprida, in moss and at a pool, 14. IV. 1957, loc. 109, protocol AZ/109/1 (2 ex.).

Madeira: Funchal, Ribeiro Seco, in ravine, 19. IV. 1957, loc. 111, protocol MA/111/1 (1 ex.); Arieiro Mts., alt. about 1700 m, river, 21. IV. 1957, loc. 114, protocol MA/114/1 (1 ex.); Rib. Frio, alt. 860 m, 7 km SW of Faial, at stream in a ravine, 21. IV. 1957, loc. 115, protocol MA/115/1 (2 ex.); Faial, at mouth of Ribeira do Faial, poço de maré (brackish well), 26. IV. 1957, loc. 129, protocol MA/129/1 (1 ex.).

From Madeira the species was described as *Lepidocyrtus lundbladi* Agrell which is a new synonym (syn. nov.) of *Heteromurus major* (Moniez). The Azores, on the other hand, form the patria typica for Moniez's *Templetonia major* (= *Heteromurus major*).

One of the commonest Entomobryids of these islands. It is eurytopic and apparently replaces the genus *Orchesella* in Madeira and the Azores.

***Pseudosinella* sp. nov.?**

Azores, Flores: Central plateau, Lagoa Branca, under stone, 14. IV. 1957, loc. 110, protocol AZ/110/1 (1 ex.).

The only specimen will be described separately at a later date.

***Tomocerus minor* (Lubbock, 1862)**

Azores, São Miguel: Sete Cidades, a spring at the steep crater side, 2. III. 1957, loc. 7, protocol AZ/7/1 (3 ex.); Sete Cidades, at Lagoa Verde, at spring under plants, 2. III. 1957, loc. 8, protocol AZ/8/1 (2 ex.); Lagoa do Pau pique, at the lake, 7. III. 1957, loc. 15, protocol AZ/15/1 (2 ex.); Furnas, in the hotel park, 10. III. 1957, loc. 22, protocol AZ/22/1 (1 ex.); Valley of Ribeira Quente, 2 km SE of Furnas, 11. III. 1957, loc. 23, protocol AZ/23/1 (1 ex.); Relva, nascente dos Lagos, spring, 15. III. 1957, loc. 32, protocol AZ/32/1 (1 ex.); ibidem, grassy ground, at spring, 15. III. 1957, loc. 32, protocol AZ/32/2 (1 ex.); Lagoa do Congro, in forest, 16. III. 1957, loc. 34, protocol AZ/34/1 (2 ex.); ibidem, in a piece of wood, 16. III. 1957, loc. 34, protocol AZ/34/2 (2 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (1 ex.); Sete Cidades, in Cryptomeria plantation, 21. III. 1957, loc. 51, protocol AZ/51/1 (2 ex.); Lagoa do Fogo, on the crater edge, 22. III. 1957, loc. 54, protocol AZ/54/2 (1 ex.); ibidem, on shore (under stone), 22. III. 1957, loc. 54, protocol AZ/54/3, AZ/54/4, AZ/54/6 (3 ex.); River NW Agua Retorta, 23. III. 1957, loc. 57, protocol AZ/57/2 (1 ex.); Pico Verde, heath, under stone, 24. III. 1957, loc. 61, protocol AZ/61/1 (1 ex.).

Azores, Santa Maria: 2 km ENE Almagreira, alt. 440 m, Miradoro dos Picos, under stone, 19. III. 1957, loc. 39, protocol AZ/39/1 (1 ex.); Pico Alto, alt. 590 m, in the vegetation at the top, 19. III. 1957, loc. 40, protocol AZ/40/1 (1 ex.).

Azores, Faial: Pool 1 km ESE of Cabeço do Fogo, Erica bush, foerna, 4. IV. 1957, loc. 90, protocol AZ/90/1 (2 ex.); Nasce Agua, 3 km S of Cedros, under boards, 5. IV. 1957, loc. 93, protocol AZ/93/1 (16 ex.).

Ma de i ra : Arieiro Mts., Rib. das Cales, alt. 1300 m, 21. IV. 1957, loc. 113, protocol MA/113/2 (2 ex.); ibidem, at a stream, 21. IV. 1957, loc. 113, protocol MA/113/1 (1 ex.); Serra de Agua, power station, alt. 600 m, grassy ground, under stone, 23. IV. 1957, loc. 120, protocol MA/120/1 (2 ex.).

Recorded already from Azores by Moniez (1889) but formerly not known to occur in Madeira.

***Tomocerus (Pogonognathellus) longicornis* (O. F. Müller, 1776)**

Ma de i ra : Rib. Frio, alt. 860 m, 7 km SW of Faial, at stream in a ravine, 21. IV. 1957, loc. 115, protocol MA/115/1 (1 ex.).

The first record of *Tomocerus longicornis* (O. F. Müll.) from these islands.

***Cyphoderus albinus* Nicolet, 1842**

Azores, Faial: Costa da Náu, 3 km NW of Capêlo, ash plain, 4. IV. 1957, loc. 88, protocol AZ/88/2 (5 ex.).

This European species has never been found before in either the Azores or Madeira. It is unknown, if the specimens to which the present reference is made, occurred in company with ants or not.

Family SMINTHURIDAE

***Sminthurides (Sphaeridia) minimus* (Schött, 1893)**

Azores, São Miguel: Lagoa do Carvão, freshwater lake, on the shore, 7. III. 1957, loc. 13, protocol AZ/13/1, AZ/13/3 (2 ex.: male and female).

This is the first record from the Azores. From Madeira the species has already been mentioned as *S. pumilis* (Krausb.) which is a synonym of *S. minimus* (Schött).

The species is very probably cosmopolitan. It may be added that the record of a "*Sminthurides (Stenacidia) violacea* (!)" from Ruanda would apply — as far as the description by Salmon (1956) indicates — to the typical form of *Sminthurides minimus* (Schött).

***Sminthurides malmgreni* (Tullberg, 1876)**

Azores, São Miguel: Ponta Delgada, grassy ground, garden, 16. III. 1957, loc. without no., protocol AZ/—/3 (1 ex.); Lagoa do Carvão, freshwater lake, on the shore, 7. III. 1957, loc. 13, protocol AZ/13/1, AZ/13/3, AZ/13/4 (162 ex.); Ribeira da tres Voltas, near Riberia Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (2 ex.).

Azores, Flores: Ribeira d'Alem da Fazenda, river, 14. IV. 1957, loc. 108, protocol AZ/108/3 (1 ex.).

Both females and males present. Not known previously to occur in either the Azores or Madeira.

A Holarctic species.

***Sminthurides schötti* Axelson, 1903**

Azores, São Miguel: Lagoa do Carvão, freshwater lake, on the shore, 7. III. 1957, loc. 13, protocol AZ/13/1, AZ/13/3, AZ/13/4 (24 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (4 ex.).

Both females and males present. Certain young and subadult females have the antenna IV subdivided in 5 sections; if so, the last two secondary joints are separated by a ring only.

Distribution confined to Europe. *Sminthurides krausbaueri* Fols. et Mills (= *S. signatus* Krausb. nec Templ.) is, in my opinion, a synonym of *S. schötti* Axels.

A new record for the islands investigated.

***Sminthurinus aureus* (Lubbock, 1862)**

Azores, São Miguel: Ponta Delgada, 2 km NE of town, swimming pool, 3. III. 1957, loc. 9, protocol AZ/—/9, AZ/—/12 (2 ex.); ibidem, 5. III. 1957, loc. 9, protocol AZ/—/1 (3 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (4 ex.).

Azores, Flores: Ribeira d'Alem da Fazenda, river, 14. IV. 1957, loc. 108, protocol AZ/108/6 (1 ex.).

Almost all specimens examined represent the blackish blue form, f. *atrata* Börner. Only one specimen of the sample AZ/—/1 differs from the uniformly pigmented pattern of that form; this aberrant specimen may be described as follows: Head dorsally white with a central blackish longitudinal line, great abdomen dorsally blackish with two white lateral stripes and with a white middle longitudinal field interrupted by 4 blackish transverse lines. Such a pattern is found in *Sminthurinus elegans* var. *transversalis* Axelson, 1905. I prefer, however, not to deal with *S. elegans* (Fitch) as a distinct species, so the form in question might be named *S. aureus* f. *transversalis*.

This Holarctic species has already been mentioned from Madeira under various names (see Nos. 55 and 56 of the Madeiran list on p. 222).

***Bourletiella arvalis* (Fitch, 1863)**

Azores, São Miguel: Ponta Delgada, 2 km NE of town, swimming pool, 5. III. 1957, loc. 9, protocol AZ/—/1 (1 ex.).

Not recorded formerly from the Azores. From Madeira the species was mentioned by Agrell (1939).

A cosmopolitan species which occasionally becomes an important pest of pastures.

***Bourletiella signata* (Nicolet, 1842)**

Azores, São Miguel: Ponta Delgada, 2 km NE of town, swimming pool, 3. III. 1957, loc. 9, protocol AZ/—/7 (1 ex.); ibidem, 5. III. 1957, loc. 9, protocol AZ/—/1 (1 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (3 ex.).

Azores, Faial: Costa da Nau, 3 km NW of Capêlo, Erica heath, 4. IV. 1957, loc. 88, protocol AZ/88/3 (5 ex.).

A cosmopolitan species which has not previously been reported from either the Azores or Madeira. It often becomes a serious pest in various plant cultures.

***Bourletiella (Deuterosminthurus) repanda* (Aagren, 1903)**

Azores, São Miguel: Ribeira da Praia, 3 km W of Villa Franca do Campo, on the shore, 13. III. 1957, loc. 27, protocol AZ/27/2, AZ/27/5 (3 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (2 ex.).

Thanks to Agrell (1939) there is a Madeiran record of *B. repanda*.

A European species when the probable original distribution is considered.

Sminthurus viridis (Linné, 1758)

Azores, Santa Maria: 3 km NE Vila do Pôrto, Fonte do Mourato, spring, 19. III. 1957, loc. 38, protocol AZ/38/1 (1 ex.).

One female without any dark pigment on abdomen. No previous record for either Azores or Madeira.

A cosmopolitan and very important pest.

Allacma fusca (Linné, 1758)

Azores, São Miguel: Furnas, park, 11. III. 1957, loc. 24, protocol AZ/24/1 (2 ex.); Caldeiras 5 km SE of Ribeira Grande, river, 14. III. 1957, loc. 28, protocol AZ/28/1 (1 ex.); River 5 km SSE of Ribeira Grande, sieved from leaves of Eucalyptus and Hedychium, 14. III. 1957, loc. 29, protocol AZ/29/1 (3 ex.); ibidem, swept in vegetation, 14. III. 1957, loc. 29, protocol AZ/29/2 (3 ex.).

Recorded from the Azores already by Moniez (1889) but not yet known from Madeira.

A Holarctic (?) species with the centre of distribution in Europe.

Sphyrotheca lubbocki (Tullberg, 1872)

Azores, São Miguel: São Populo, 7,5 km E of Ponta Delgada, grassy ground at the sea, 4. III. 1957, loc. 10, protocol AZ/10/2 (1 ex.).

Azores, Faial: Cabeço do Fogo, Erica bush, foerna, 4. IV. 1957, loc. 90, protocol AZ/90/4 (1 ex.).

Gama (1959) found this European species already in her material from Madeira. Not previously known to occur in the Azores.

Family PAPIRIIDAE

Dicyrtoma minuta (O. Fabricius, 1783)

Azores, São Miguel: São Populo, on the beach, 1. III. 1957, loc. 3, protocol AZ/—/8 (2 ex.); São Populo, 7,5 km E of Ponta Delgada, sandy grassy ground, 1. III. 1957, loc. 3, protocol AZ/3/5 (1 ex.); ibidem, grassy ground, on the beach, 1. III. 1957, loc. 3, protocol AZ/3/4 (1 ex.); Sete Cidades, at Lagoa Azul, at spring in vegetable debris, 2. III. 1957, loc. 7, protocol AZ/7/3 (1 ex.); Fonte Grande SE Feteiras, at spring, 6. III. 1957, loc. 12, protocol AZ/12/3 (1 ex.); Caldeira das Sete Cidades, in Cryptomeria plantation, 8. III. 1957, loc. 18, protocol AZ/18/9 (2 ex.); Furnas, park, 11. III. 1957, loc. 24, protocol AZ/24/2 (2 ex.); Ribeira da Praia, 3 km W of Villa Franca do Campo, swept in vegetation (ferns, Vinca), 13. III. 1957, loc. 27, protocol AZ/27/3 (1 ex.); ibidem, river bank, 13. III. 1957, loc. 27, protocol AZ/27/4 (1 ex.); ibidem, on shore, 13. III. 1957, loc. 27, protocol AZ/27/5 (7 ex.); Caldeiras, 5 km SE of Ribeira Grande, under stone, 14. III. 1957, loc. 28, protocol AZ/28/2 (1 ex.); ibidem, in a ravine (below bridge), 14. III. 1957, loc. 28, protocol AZ/28/5, AZ/28/3 (7 ex.); ibidem, on hot stream, grassy mossy ground, 14. III. 1957, loc. 28, protocol

AZ/28/4 (1 ex.); River 5 km SSE of Ribeira Grande, sieved from leaves of Eucalyptus and Hedychium, 14. III. 1957, loc. 29, protocol AZ/29/1 (7 ex.); ibidem, swept in vegetation, 14. III. 1957, loc. 29, protocol AZ/29/2 (6 ex.); Relva, nascente dos Lagos, spring, 15. III. 1957, loc. 32, protocol AZ/32/3 (3 ex.); Ribeira das tres Voltas, near Ribeira Chã, river, 16. III. 1957, loc. 35, protocol AZ/35/1 (2 ex.); ibidem, stream, 16. III. 1957, loc. 35, protocol AZ/35/2 (1 ex.); Caldeira das Sete Cidades, at Lagoa Azul, in Cryptomeria plantation, under Hedychium, 21. III. 1957, loc. 50, protocol AZ/50/5 (2 ex.); Lagoa do Fogo, wet heath (Vaccinium, Calluna), 22. III. 1957, loc. 54, protocol AZ/54/7 (2 ex.); River NW Agua Retorta, on shore, 23. III. 1957, loc. 57, protocol AZ/57/3 (2 ex.); Furnas, hot springs, wet heath, 24. III. 1957, loc. 59, protocol AZ/59/2 (1 ex.).

Azores, Santa Maria: 3 km NE Vila do Pôrto, Fonte do Mourato, spring, 19. III. 1957, loc. 38, protocol AZ/38/1 (1 ex.).

Azores, Faial: Ribeira das Cabras, 1 km NO of Praia do Norte, in Pittosporum plantation in a ravine, 2. IV. 1957, loc. 76, protocol AZ/76/1 (1 ex.); Zona do Misterio, 2 km W of Praia do Norte, in detritus in a forest, 2. IV. 1957, loc. 80, protocol AZ/80/1 (1 ex.); Cabeço do Canto, Erica bush, 4. IV. 1957, loc. 89, protocol AZ/89/1, AZ/89/2 (2 ex.); 3 km WNW of Pedro Miguel, freshwater pool, 5. IV. 1957, loc. 92, protocol AZ/92/3 (3 ex.); Nasce Agua, 3 km S of Cedros, under boards, 5. IV. 1957, loc. 93, protocol AZ/93/1 (3 ex.).

Azores, Pico: Volc. Pico, W side, alt. about 800 m, under stone, 8. IV. 1957, loc. 97, protocol AZ/97/4, AZ/97/5 (3 ex.).

Azores, Flores: Ribeira d' Alem da Fazenda, river, 14. IV. 1957, loc. 108, protocol AZ/108/3, AZ/108/6 (2 ex.); ibidem, dry grassy ground, 14. IV. 1957, loc. 108, protocol AZ/108/5 (1 ex.).

Very variable in pigmentation: f. *pallida* (only ocellar fields and antennae pigmented; AZ/97/4 and one specimen of the sample AZ/97/5), f. *flavosignata* (AZ/28/3 and many specimens of AZ/28/5), f. *violacea* (5 specimens of AZ/29/2, later AZ/38/1, AZ/59/2, AZ/80/1), f. *scalaris* (one specimen of AZ/57/3), f. *typica* (one specimen of AZ/29/2, one of AZ/97/5, etc.), as well as numerous transitions (f. *scalaris* — f. *violacea*, AZ/108/3, for example).

Already mentioned from Madeira but not from the Azores.

Papirius cursor Lubbock, 1862

Azores, São Miguel: Lagoa do Carvão, freshwater lake, on the shore, 7. III. 1957, loc. 13, protocol AZ/13/1 (1 ex.); 3 km W of Porto Formoso, in detritus in a crevice near the road, 9. III. 1957, loc. 20, protocol AZ/20/1 (2 ex.).

Azores, Faial: Porto do Salão, on shore, under stone, 1. IV. 1957, loc. 75, protocol AZ/75/1 (1 ex.).

Three specimens from São Miguel correspond to a young instar of the typical form, the fourth example from Faial represents the dark pigmented form, f. *silvaticus*.

This Palaearctic species has not previously been recorded either from the Azores or Madeira.

III. General remarks

The present flora of the Macaronesian islands Azores and Madeira is far from virgin: a great deal of the original vegetation is substituted by various plantations of exotic species. Madeira, for example, introduced the first grape-vine cultures from Crete and Cyprus as early as in about the middle of the 15th century. The extensive forests covering that island in the days of its discovery are extinct now. As for the Azores, we may refer to an old source of information („Kurze Geographie“, p. 344) according to which some introduced cultures must have existed there already before 1790: „Die Insel Piko . . . hat fürtreffliche Weine, Holz im Ueberfluß, besonders Cedern und ein hochrothes Holz, welches sehr geschätzt wird. — Die Insel Fayal ist fruchtbar an Weizen und türkischem Korn.“

A good deal of the collections made by the Lund University expedition in 1957 refer thus to exotic cultures (plantations), e. g. *Cryptomeria* (the so-called Japanese Cedar), *Pittosporum*, *Eucalyptus* and *Hedychium*. These biotopes are characterized as a rule of banal Collembolan species which occur abundantly in other, indigenous biocoenoses (*Hypogastrura armata*, *Neanura muscorum*, *Onychiurus ambulans*, *O. ghidinii*, *Isotoma notabilis*, *Isotomurus palustris*, *Entomobrya nivalis*, *Heteromurus major*, *Tomocerus minor*, *Allacma fusca*, *Dicyrtoma minuta*).

The composition of the Azorean communities of Collembola is at present little known; two examples, however, are presented in Table 1.

Table 1. Representation of Azorean Collembola at two localities

	Swimming pool on grassy ground in garden, Ponta Delgada, São Miguel	Ribeira d'Alem da Fazenda, river, Flores
<i>H. manubrialis</i>	+	+
<i>H. armata</i>	+	—
<i>X. maritima</i>	+	—
<i>F. mirabilis</i>	+	—
<i>O. lamellifera</i>	—	+
<i>P. madeirensis</i>	+	—
<i>T. matthesi</i>	—	+
<i>P. sensibilis</i>	—	+
<i>I. palustris</i>	+	+
<i>H. major</i>	+	—
<i>S. malmgreni</i>	—	+
<i>S. aureus</i>	+	+
<i>B. arvalis</i>	+	—
<i>B. signata</i>	+	—
<i>D. minuta</i>	—	+

The qualitatively richest sample of Collembola from the Azores included 22 different species. It was collected on a river station near Ribeira Chã, São Miguel (loc. 35): *Hypogastrura armata*, *Choreutinula libyca*, *Xenylla maritima*, *Neanura montana*, *Pseudachorutes subcrassus*, *Onychiurus ghidinii*, *Proctostephanus madeirensis*, *Proisotoma thermophila*, *P. minuta*, *P. schötti*, *P. laticauda*, *Isotoma trispinata*, *Isotomurus palustris*, *Entomobrya nivalis*, *Heteromurus major*, *Tomocerus minor*, *Sminthurides malmgreni*, *S. schötti*, *Sminthurinus aureus*, *Bourletiella signata*, *B. repanda*, and *Dicyrtoma minuta*.

The composition of the Madeiran communities cannot be discussed in this paper, as very few Collembola were collected in that island by the present expedition.

It is a pity that our knowledge of the Collembola of the Canaries is so scanty, since we cannot state with certainty whether certain species found in Madeira or the Azores are endemic or not so. They might occur also in the Canaries.

The most striking connection between the Macaronesian and the Mediterranean faunas of Collembola is presented by the species *Proctostephanus stuckeni*, *P. madeirensis* and *Heteromurus major*. A number of Azorean species indicate relations with the Ethiopian region (*Acherontiella bougisi*, *Neanura montana* and, perhaps, *Choreutinula libyca*). Other species seem to have travelled to the Macaronesian subregion from North America (*Proisotoma laticauda*, *Isotoma trispinata*). Most of the Azorean and Madeiran Collembola are, however, introduced cosmopolitan species of Palaearctic origin.

Some species may become noxious to plant cultures (e. g., *Bourletiella*, *Sminthurus*) or even serve as food for economically important animals (*Sminthurides*, eaten occasionally by fish).

Additional specimens of Collembola expected to be found in the Azorean samples of the Lund University Expedition will be included in the final report appearing in the *Boletim do Museu municipal do Funchal*.

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