

COLLEMBOLA FROM THE AZORES AND MADEIRA,  
COLLECTED BY THE LUND UNIVERSITY  
EXPEDITION IN 1957<sup>1</sup>

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With 4 plates

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 the nine islands of the Azorean group, 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: *Smynthurus 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* Den. or *O. pseudinermis* Börn.?). All these species were recorded by Moniez (1889). Finally, Stach (1951) mentions *Neanura muscorum* (Templ.) from the Azores.

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Our knowledge of the Madeiran Collembola was, on the other hand, relatively advanced when we began writing 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 contains 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. *Odontella (Xenylloides) armata* 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 (Isotomina) thermophila* (Axels.)—Gama 1959.

32. *Proisotoma (Isotomina) coeruleoqrisea* (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 mauli* 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 (Deuterostminthurus) 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.

The material examined by Paclt has been mounted in polyvinyl alcohol. The material determined by Bødvarsson is preserved in alcohol. All the material is kept in the Entomological Museum of the Zoological Institute, Lund.

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## 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 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 três Voltas, near Ribeira Chã, almost dry spring, 23.III.1957, loc. 55, protocol AZ/55/1 (1 ex.); Ribeira Seca, W Ribeira Grande, 18.III.1957, loc. 37 (1 ex.); *ibidem*, 18.III.1957, loc. 37 (1 ex.); *ibidem*, 18.III.1957, loc. 37 (314 ex.); Lagoa das Furnas, 24.III.1957, loc. 58 (8 ex.); Ponta Delgada, among decaying leaves, Berlese sample, 13.III.1957, loc. without No. (9 ex.).

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

Azores, Flores: Ribeira d'Além 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 a mature Laboulbeniales on the left antenna.

*Hypogastrura (Ceratophysella) armata* (Nicolet, 1841)

Azores, São Miguel: Ponta Delgada, 2 km NE of town, at 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 três Voltas, near Ribeira Chã, river, 16.III.1957, loc. 35, protocol AZ/35/1 (39 ex.); Ribeira Seca W Ribeira Grande, 18.III.1957, loc. 37 (2 ex.); Lagoa do Carvão, 7.III.1957, loc. 13 (1 ex.); Ribeira Seca, W R. Grande, 18.III.1957, loc. 37 (89 ex.); Sete Cidades, at Lagoa Verde, drift material, 2.III.1957, loc. 8 (38 ex.); Fonte Grande SE Feteiras, in detritus, 6.III.1957, loc. 12 (13 ex.); Ponta Delgada, among decaying leaves, Berlese sample, 13.III.1957, loc. without No. (320 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, furna, 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 were 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 it does not seem advisable 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 três 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, Southern Sweden (unpublished), 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 três Voltas, near Ribeira Chã, river, 16.III.1957, loc. 35, protocol AZ/35/1 (3 ex.); São Pópulo, 7.5 Km E of Ponta Delgada, grassy ground, 1.III.1957, loc. 3 (4 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.

#### *Xenylla grisea* Axelson, 1900

Azores, São Miguel: Fonte Grande SE Feteiras, in detritus, 6.III.1957, loc. 12 (3 ex.); Ribeira das três Voltas, near Ribeira Chã, river, 16.III.1957, loc. 35, protocol Az/35/1 (2 ex.).

Not previously recorded from the islands.

*Acherontiella bougisi* Cassagnau et Delamare, 1955

Azores, São Miguel: Fonte Grande SE Feteiras, in detritus, 6.III.1957, loc. 12 (2 ex.).

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.); Lagoa do Congro, 16.III.1957, loc. 34 (2 ex.).

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

*Odontella lamellifera* (Axelson, 1903)

Azores, Flores: Ribeira d'Além 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 (Pl.1, Fig. 5, 1912) 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.

*Odontella (Xenyllodes) armata* (Axelson, 1903)

Azores, São Miguel: At Lagoa do Fogo, 22.III.1957, Loc. 54 (3 ex.). Already reported, by Gama, from Madeira.

*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 três Voltas, near Ribeira Chã, river, 6.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 três 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 either from the 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 pond, 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/29/1. 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'Além 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, a Laboulbeniales.

### *Onychiurus ghidinii* Denis, 1938

Azores, São Miguel: São Pópulo, 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 Três 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.); Lagoa do Congro, 16.III.1957, loc. 34 (2 ex.); *ibidem*, 16.III.1957, loc. 34 (1 ex.); Sete Cidades, at Lagoa Verde, drift material, 2.III.1957, loc. 8 (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.).

Madeira: 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 *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 material 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 it was impossible 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 part of the polymorphic male (female) generation.

### *Onychiurus armatus* (Tullberg, 1869)

Azores, São Miguel. São Pópulo, 7.5 km E of Ponta Delgada, sandy grassy ground, 1.III.1957, loc. 3 (1 ex.); at Lagoa do Fogo, 22.III.1957 loc. 54 (2 ex.).

Curiously enough, this cosmopolitan species has previously been recorded neither from the Azores nor Madeira.

With respect to the arrangement of pseudocelli the animals are of two types (cf. Gisin 1960): 1) 33/023/33342; 2) 32/022/33342. In the first type the connecting lines of the four preanal setae form an angle of about 90° and cross on the limit between abd. V and VI. In the second type these lines form an angle of about 160°. The following characters are

common to both types: Ventral side of head with 1 + 1 pseudocelli; sub-coxae each with 1 pseudocellus; chaetotaxy of thorax I i 3m; abdominal segments without the extra seta s'; ventral tube with 2 + 2 setae; the seta M on abd. V approximately as long as the anal spines; empodial appendage as long as the claw; claw without teeth; anal spines twice as long as their diameter at the base; rudiment of furcula typical of the armatus-group; all three individuals examined were females.

As shown by Bödvarsson (1959) these characters are very variable and they seem to form a series of variations within a single polymorphic species. Therefore, Gisin's use of these characters as species characters does not seem to be justified, and consequently the individuals are referred to the species *Onychiurus armatus* (Tullberg).

*Tullbergia krausbaueri* Börner, 1901

Azores, São Miguel: At Lagoa do Fogo, 22.III.1957, loc. 54 (1 ex.). This widely distributed species has already been reported from Madeira.

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 Três Voltas, near Ribeira Chã, river, 16.III.1957, loc. 35, protocol AZ/35/1 (1 ex.); Ribeira Seca, W Ribeira Grande, 18.III.1957, loc. 37 (19 ex.); Fonte Grande SE Feteiras, in detritus, 6.III.1957, loc. 12, (1 ex.); Ponta Delgada, among decaying leaves, Berlese sample, 13.III.1957, loc. without No. (2 ex.).

Madeira: Arieiro Mts., Ribeira das Cales, alt. 1.300 m, 21.IV.1957, loc. 113, protocol MA/113/2 (1 ex.).

Apart from the Azores and Madeira, this species is reported from 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.).

This 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 três Voltas, near Ribeira Chã, almost dry spring, 23.III.1957, loc. 55, protocol AZ/55/1 (1 ex.).

Azores, Flores: Ribeira d'Além 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 macrocheta 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. Tibio-tarsal 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 like 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: At Lagoa das Furnas, at warm spring, 10.III.1957, loc. 22, protocol AZ/22/5 (1 ex.); Lagoa do Congro, 16.III.1957, loc. 34 (1 ex.);

Azores, Flores: Ribeira d'Além 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 we perfectly agree with Stach according to whom *F. distincta* Bagn. and *F. kingi* Bagn. are merely unimportant forms of *F. candida* Willem.

*Isotomodes trisetosus* (Denis, 1923)

Azores, São Miguel: São Pópulo 7.5 km E of Ponta Delgada, sandy grassy ground, 1.III.1957, loc. 3 (4 ex.); São Pópulo, 7.5 km E of Ponta Delgada, sandy grassy ground, 1.III.1957, loc. 3 (1 ex.).

This species, which comes very near to *I. productus* (Axelson) and perhaps should be taken as a variety hereof, has been reported — often under the name *I. plurisetosus* (Den.) — from Madeira and some other South and Central European countries.

*Folsomides parvulus* Stach, 1922 (cf. Gisin 1960, p. 188)

Azores, São Miguel: Fonte Grande SE Feteiras, in detritus, 6.III.1957, loc. 12 (5 ex.).

The species has been collected in Southern Sweden (Skåne, unpublished) and Central Europe. This is the first record from the Atlantic islands.

*Proisotoma minuta* (Tullberg, 1871)

Azores, São Miguel: Ribeira das três Voltas, near Ribeira Chã, river, 16.III.1957, loc. 35, protocol AZ/35/1 (5 ex.); At Lagoa do Fogo, 22.III.1957, loc. 54 (1 ex.).

Cosmopolitan in distribution and already recorded from Madeira.

*Proisotoma schötti* (Dalla Torre, 1895)

Azores, São Miguel: Ribeira das três 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 três 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.

*Proisotoma (Isotomina) 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 três Voltas, near Ribeira Chã, river, 16.III.1957, loc. 35, protocol AZ/35/1 (4 ex.); Ribeira Seca, W. Ribeira Grande, 18.III.1957, loc. 37 (23 ex.); Fonte Grande SE Feteiras, in detritus, 6.III.1957, loc. 12 (9 ex.); Ponta Delgada, among decaying leaves, Berlese sample, 13.III.1957, loc. without No. (139 ex.).

Azores, Faial: Pool 1 km ESE of Cabeço do Fogo, 4.IV.1957, loc. 90 (1 ex.).

A widely distributed species and already recorded from Madeira.

*Proisotoma (Isotomina) pontica* (Stach, 1947)

Azores, São Miguel: São Pópulo 7.5 km E of Ponta Delgada, grassy ground, 1.III.1957, loc. 3 (4 ex.).

Found in Southern Europe from France in the West to the Caucasus in the East. This is the first record from these islands.

*Proisotoma (Isotomina) scapellifera* (Gisin, 1955)

Azores, São Miguel: Fonte Grande SE Feteiras, in detritus, 6.III.1957, loc. 12 (1 ex.).

The following deviations from Gisin's description of this species were noted in the Azorean specimen: Antennae with 3 thick, cylindrical

sensory hairs; anterior margin of PAO not constricted in the middle; dentes with 15 setae on the front side; abd. V has on each side 4 lancet-formed hairs, one lying in the most anterior row of setae on abd. V, 3 somewhat farther back.

On account of these deviations, the Azorean specimen perhaps represents a local geographical race or subspecies.

The species was previously known only from Central Germany.

#### *Isotomiella minor* (Schäffer, 1896)

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

Probably a cosmopolitan species which has already been recorded from Madeira.

#### *Pseudisotoma sensibilis* (Tullberg, 1876)

Azores, São Miguel: At Lagoa do Fogo, 22.III.1957, loc. 54 (5 ex.).

Azores, Flores: Ribeira d'Além da Fazenda, 14.IV.1957, loc. 108, protocol AZ/10/3 (11 ex.); *ibidem*, 14.IV.1957, loc. 108 (1 ex.).

This Palaearctic species is known to occur commonly in Madeira. It has not before been reported 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.); Fonte Grande SE Feteiras, in detritus, 6.III.1957, loc. 12 (6 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 maritima* Tullberg, 1871

Azores, São Miguel: 2 km SW of Porto Formoso, in a stone pit, 11.III.1957, loc. 25 b, protocol AZ/—/2 (1 ex.); 3 km W of Porto Formo-

so, in detritus on mountain side near the road, 9.III.1957, loc. 20, protocol AZ/20/1 (28 ex.); Ribeira das Três Voltas, near Ribeira Chã, river, 16.III.1957, loc. 35, protocol AZ/35/1 (13 ex.); Sete Cidades, at Lagoa Verde, drift material, 2.III.1957, loc. 8 (7 ex.).

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

Widely distributed along the European Atlantic and Mediterranean coasts and also reported from inland localities. *Isotoma trispinata* Mac Gillivray, 1896, described from the U. S. A. and not reported from other continents, is very probably a synonym of *I. maritima* Tullb.

#### *Isotoma viridis* Bourlet, 1839

Azores, São Miguel: Fonte da Rocha near Relva, 4.5 km W of Ponta Delgada, rock spring, 5.III.1957, loc. 11, protocol AZ/11/1 (1 ex.); Lagoa do Congro, 16.III.1957, loc. 34 (2 ex.).

Azores, Pico: Volc. Pico, W side, alt. 1000-1100 m, *Erica* bush at snow line, 8.IV.1957, loc. 95, protocol AZ/95/2 (3 ex.); Volc. Pico, W side, alt. about 800m, 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 P. 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 três 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 três Voltas, near Ribeira Chã, almost dry spring, 23.III.1957, loc. 55, protocol AZ/55/1 (11 ex.); Tanque (pond) 1 km SE Lagoa do Congro, 16.III.1957, loc. 33 (1 ex.); *ibidem*, 16.III.1957, loc. 33 (2 ex.); Lagoa das Furnas, 24.III.1957, loc. 58 (78 ex.); Sete Cidades, at Lagoa Verde, drift material, 2.III.1957, loc. 8, (20 ex.); Ponta Delgada, among decaying leaves, Berlese sample, 13.III.1957, loc. without No. (6 ex.); Fonte da Rocha near Relva 4.5 km of W of P. Delgada, fresh well (poço) 5.III.1957, loc. 11 (1 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 Água, 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'Além 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 the Azores and Madeira,

The sample AZ/—/10 includes a specimen infested with 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 Pópulo, 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 Vila Franca do Campo, swept in vegetation, 13.III.1957, loc. 27, protocol AZ/27/1 (1 ex.); Ribeira das Três Voltas, near Ribeira Chã, river, 16.III.1957, loc. 35, protocol AZ/35/1 (4 ex.); At 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.); São Pópulo, 7.5 km E of Ponta Delgada, grassy ground, 1.III.1957, loc. 3 (6 ex.); Sete Cidades, at Lagoa Verde, drift material, 2.III.1957, loc. 8 (2 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 NE of Praia do Norte, in *Pittosporum* plantation in a ravine, 2.IV.1957, loc. 76, protocol AZ/76/1 (1 ex.); Costa da Nau, 3 km NW of Capelo, 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'Além 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 species, which varies greatly in pigmentation pattern, has been mentioned already, — mostly under the synonym of *E. multifasciata* (Tullb.) — from the Azores and Madeira.

### *Sinella 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 species. It has not been reported previously 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 Pópulo,

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, 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 três 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 três Voltas, near Ribeira Chã, almost dry spring, 23.III.1957, loc. 55, protocol AZ/55/1 (1 ex.); River NW Água 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.); São Pópulo, 7.5 km E of Ponta Delgada, grassy ground, 1.III.1957, loc. 3 (3 ex.); Ponta Delgada, among decaying leaves, Berlese sample, 13.III.1957, loc. without No. (3 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 Nau, 3 km NW of Capelo, *Erica* bush, litter 4.IV.1957, loc. 88, protocol AZ/88/1 (1 ex.); Cabeço do Canto, *Erica* bush, 4.IV.1957, loc. 89, protocol AZ/89/1 (3 ex.); Cabeço do Fogo, *Erica* bush, litter 4.IV.1957, loc. 90, protocol AZ/90/2 (2 ex.); Nasce Água, 3 km S of Cedros, under stones, 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 800m, 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'Além 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 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. 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 Rib. 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 m.*).

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

### *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.); Lagoa do Congro, 16.III.1957, loc. 34 (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 três 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 Água 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, Miradouro 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, litter 4.IV.1957, loc. 90, protocol AZ/90/1 (2 ex.); Nasce Água, 3 km S of Cedros, under boards, 5.IV.1957, loc. 93, protocol AZ/93/1 (16 ex.).

Madeira: Arieiro Mts., Ribeira das Cales, at. 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 d'Água, power station, alt. 600 m, grassy ground, under stone, 23.IV.1957, loc. 120, protocol MA/120/1 (2 ex.).

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

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

Madeira: Ribeiro 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 Nau, 3 km NW of Capelo, ash plain, 4.IV.1957, loc. 88, protocol AZ/88/2 (5 ex.).

This European species has never been found before either in the Azores or in Madeira. It is not known, whether 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); Ponta Delgada, among decaying leaves, Berlese sample, 13.III.1957, loc. without No. (2 ex.); Ribeira Seca, West of R. Grande, 18.III.1957, loc. 37 (3 ex.).

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. Thus, the record of a «*Sminthurides (Stenacidia) violacea* [!]

» from Ruanda would apply—as far as the description by Salmon (1956) indicates—to the typical form or *Sminthurides minimus* (Schött).*Sminthurides (Stenacidia) violaceus* (Reuter, 1878)

Azores, São Miguel: Ponta Delgada, among decaying leaves, Berlese sample, 13.III.1957, loc. without No. (2 ex.).

Previously not reported from these islands.

*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 das três Voltas, near Ribeira Chã, river, 16.III.1957, loc. 35, protocol AZ/35/1 (2 ex.); Lagoa das Furnas, 24.III.1957, loc. 58, (3 ex.); At Lagoa do Fogo, 22.III.1957, loc. 54 (15 ex.).

Azores, Flores: Ribeira d'Além da Fazenda, river, 14.IV.1957, loc. 108, protocol AZ/108/3 (1 ex.); Central Plateau, Lagoa Eranca, freshwater lake, 14.IV.1957, loc. 110 (1 ex.).

Both males and females 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 três 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 evident 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 Paclt's 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 três Voltas, near Ribeira Chã, river, 16.III.1957, loc. 35, protocol AZ/35/1 (4 ex.); Sete Cidades, at Lagoa Verde, drift material, 2.III.1957, loc. 8 (2 ex.); Ponta Delgada, among decaying leaves, Berlese sample, 13.III.1957, loc. without No. (4 ex.).

Azores, Flores; Ribeira d'Além 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, 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. We 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. 23).

*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.); Ponta Delgada, among decaying leaves, Berlese sample, 13.III.1957, loc. without No. (1 ex.).

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

A cosmopolitan species which occasionally becomes a serious 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 três 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 Capelo, *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 Vila Franca do Campo, on shore, 13.III.1957, loc. 27, protocol AZ/27/2, AZ/27/5 (3 ex.); Ribeira das três 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*. Originally a European species.

*Sminthurus viridis* (Linnaeus, 1758)

Azores, Santa Maria: 3 km NE Vila do Porto, 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 the Azores or Madeira.

A cosmopolitan and very serious 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 Pópulo, 7.5 km E of Ponta Delgada, grassy ground at the sea, 4.III.1957, loc. 10, protocol AZ/10/2 (1 ex.); Fonte Grande SE Feteiras, in detritus, 6.III.1957, loc. 12 (5 ex.).

Azores, Faial: Cabeço do Fogo, *Erica* bush, litter, 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 Pópulo, on the beach, 1.III.1957, loc. 3, protocol AZ/—/8 (2 ex.); São Pópulo, 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 Vila 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 três 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 Água 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.); 1 km N of Povoação, Ribeira dos Lagos, 24.III.1957, loc. 60 (1 ex.); Lagoa do Congro, 16.III.1957, loc. 34 (1 ex.); Sete Cidades, at Lagoa Verde, drift material, 2.III.1957, loc. 8 (1 ex.); São Pópulo, 7.5 km E of Ponta Delgada, sandy grassy ground, 1.III.1957, loc. 3 (1 ex.); At Lagoa do Fogo, 22.III.1957, loc. 54 (2 ex.).

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

Azores, Faial: Ribeira das Cabras, 1 km NE of Praia do Norte, in *Pittosporum* plantation in a ravine, 2.IV.1957, loc. 76, protocol AZ/76/1 (1 ex.); Zona do Mistério, 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 Água, 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'Além 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 specimen from Faial represents the dark pigmented form, f. *silvaticus*.

This Palearctic 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 by 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.

Species \ Locality	At swimming pool, on grassy ground, in garden, Ponta Delgada, São Miguel	Ribeira d'Além da Fazenda, river, Flores
<i>H. manubrialis</i>	+	+
<i>H. armata</i>	+	-
<i>X. maritima</i>	+	-
<i>E. 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 quantitatively richest sample of Collembola from the Azores included 23 species. It was collected on a river station near Ribeira Chã, São Miguel (loc. 35): *Hypogastrura armata*, *Choreutinula libyca*, *Xenylla ma-*

ritima, *X. grisea*, *Neanura montana*, *Pseudachorutes subcrassus*, *Onychiurus ghidinii*, *Proctostephanus madeirensis*, *Proisotoma minuta*, *P. schötti*, *P. laticauda*, *P. thermophila*, *Isotoma maritima*, *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. They might occur also in the Canaries.

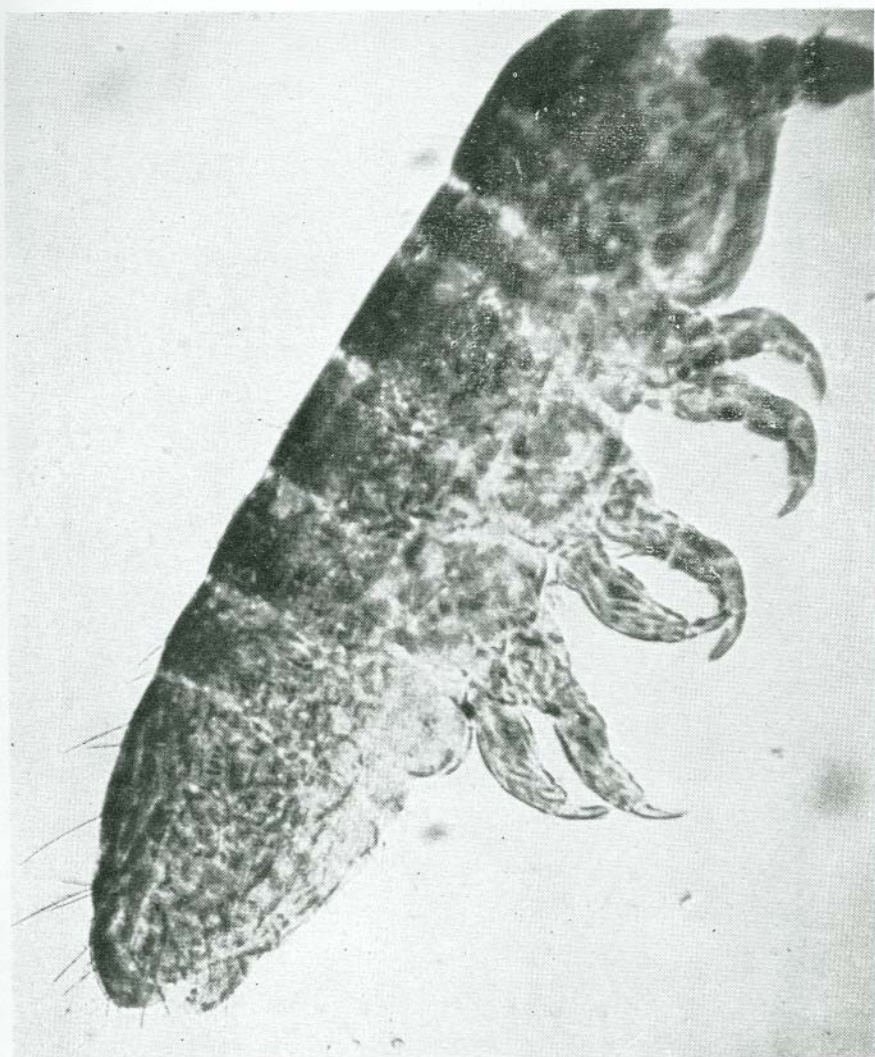
The most striking connection between the Macaronesian and the Mediterranean faunas of Collembola is presented by the species *Proctostephanus stuckeni*, *P. madeirensis* and *Heteromurus major*. A number of Azorean species indicate relations with the Ethiopian region (*Acherontiella bougisi*, *Neanura montana* and very probably *Choreutinula libyca*). Other species seem to have travelled to the Macaronesian subregion from North America (*Proisotoma laticauda*). 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 by fish).

#### REFERENCES

- Agrell, I.:  
1939. Die Arthropodenfauna von Madeira nach den Ergebnissen der Reise von Prof. Dr. O. Lundblad, Juli-August 1935. XVIII. Collembola. *Ark. Zool. (B)* 31 (10): 1-7.
- Bødvarsson, H.:  
1959. Studien über die Variation einiger systematischen Charaktere bei *Onychiurus armatus* (Tullberg, 1869) (Collembola). *Opusc. entomol.* 24: 225-245.
- Delamare Deboutteville, C. et Bassot, J. M.:  
1957. Collemboles Symphypléones de Madère et remarques biogéographiques. *Vie et Milieu* 8: 76-86.
- Denis, J. R.:  
1923. Notes sur les Aptérygotes. I. Sur quelques Aptérygotes décrites par M. Moniez. *Ann. Soc. entomol. France* 92: 209-236.
- Gama, M. M. da:  
1959. Contribuição para o estudo dos Colembolos do Arquipélago da Madeira. *Mem. Estud. Mus. zool. Univ. Coimbra* 257: 1-42.

- Gisin, H.:  
1958. Collemboles récoltés par M. Bassot à Madère. *Vie et Milieu* 8: 473-478.  
1960. Collembolenfauna Europas. Genève.
- Kurze Geographie von Asien, Afrika, Amerika und den Südländern. Versuch einer Fortsetzung von Ruffs Geographie für Kinder. Frankfurt u. Leipzig 1790.
- Moniez, R.:  
1889. Notes sur les Thysanoures. I. Espèces qui vivent aux Açores. *Rev. biol. Nord France* 2: 24-31.
- Pact, J.:  
1956. Biologie der primär flügellosen Insekten. Jena.
- Stach, J.:  
1951. The Apterygotan fauna of Poland in relation to the world-fauna of this group of insects (Family Bilobidae). *Acta Monogr. Mus. Hist. natur.* 4: 1-97.



*Odontella lamellifera* (Axels.). Note the chetotaxy of the posterior part of abdomen. Azores (Flores), loc. 108. 60 $\times$  (microscopical magnification).



Lava beach at São Pópulo, 7.5 km E of Ponta Delgada on São Miguel (Azores). Locality 10.  
On the beach and in the grassy ground above the rugged cliffs a rich collembolan  
fauna lived. Photo P. Brinck & E. Dahl.

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PLATE II

BOL. MUS. MUN., XIV





River valley at Ribeira d'Além da Fazenda, Flores (Azores). Locality 108. Collembola were collected on the slopes as far down as to the shores of the river. Cf. list of species p. 48. Photo P. Brinck & E. Dahl.

5300



Ribeira das três Voltas near Ribeira Chã, São Miguel (Azores). Locality 35. Among the vegetable debris along the shores of the stream 23 species were collected (vide list p. 49). This was the quantitatively richest sample obtained in these islands. Photo P. Brinck & E. Dahl.

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PLATE IV

BOL. MUS. MUN., XIV