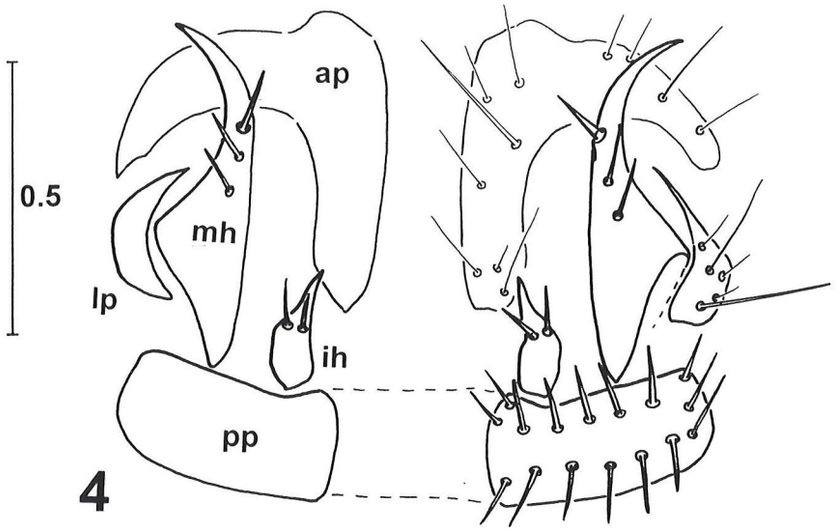

Fig. 4:
Abdominal tergite V, *Pentacomia cribrata* (BRULLÉ), L_3.
ap - apical part, **ih** - inner hook, **lp** - lateral part, **mh** - median hook, **pp** - posterior part.

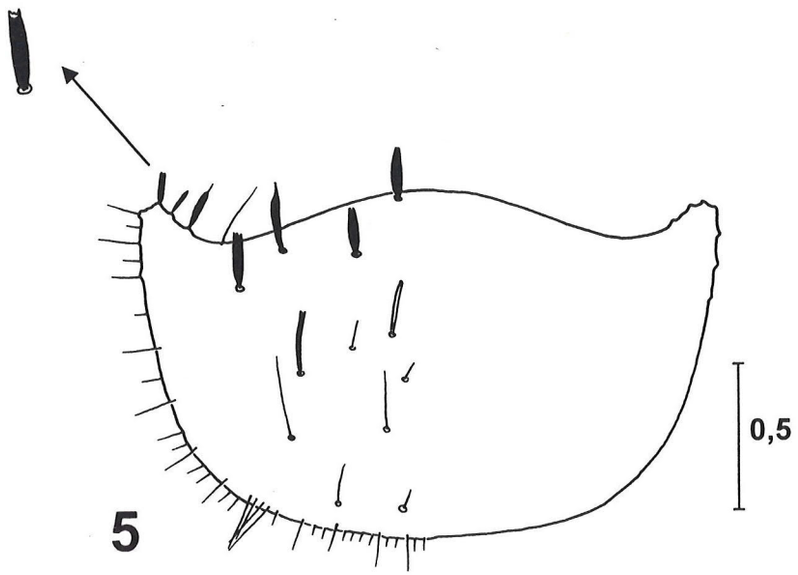

Fig. 5:
Pronotum, *Pentacomia egregria* (CHAUDOIR), L_3. Arrow: flattened setae, these setae are black in the figured species contrary to the white color of thin setae (redrawn from ARNDT et al. 1996).

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Known and new genera and species of Symphypleona (Insecta, Collembola) obtained by canopy fogging in Central Amazonia, Brazil

by

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Abstract

Arthropoda were collected by fogging the canopies of two tree species, *Goupia glabra* and *Calophyllum brasiliense* in the Adolpho Ducke Forest Reserve near Manaus, Amazonia/Brazil. The Collembola Symphypleona obtained by these studies are described here. The 45 specimens collected belong to 9 species from 6 genera; 8 species and 2 genera (*Adisius maculatus* n.g. n.sp., *Adisius fuscus* n.g. n.sp., *Arborianna cupiubae* n.g. n.sp., *Sminthurinus aureussetosus* n.sp., *Sphaeridia bivirgata* n.sp., *Sphaeridia duckei* n.sp., *Sphyrotheca caputalba* n.sp., *Sphyrotheca coeruleocapitata* n.sp.) are new to science.
Key words: **Collembola, Symphypleona, canopy fogging, terra firme, Amazon, Neotropics, Brazil.**

Resumo

Artrópodos foram coletados fumigando-se as copas de duas espécies de árvores, *Goupia glabra* e *Calophyllum brasiliense* na Reserva Florestal Adolpho Ducke perto de Manaus, Amazônia/Brasil. Os Collembola Symphypleona obtidos nestes estudos são aqui descritos. Os 45 indivíduos coletados pertencem à 9 espécies de 6 gêneros; 8 espécies e 2 gêneros (*Adisius maculatus* n.g. n.sp., *Adisius fuscus* n.g. n.sp., *Arborianna cupiubae* n.g. n.sp., *Sminthurinus aureussetosus* n.sp., *Sphaeridia bivirgata* n.sp., *Sphaeridia duckei* n.sp., *Sphyrotheca caputalba* n.sp., *Sphyrotheca coeruleocapitata* n.sp.) são novos para a ciência.

Introduction

The canopies of tropical forests have attracted more and more attention in recent years as regions of high biological diversity. Canopy arthropods have been discussed in several publications (e.g. ADIS et al. 1998; GUILBERT et al. 1995; HARADA & ADIS 1998; PALACIOS-VARGAS et al. 1999; STORK et al. 1996). In the present paper, the Collembola Symphypleona collected near Manaus, Amazonia/Brazil, by J. Adis, Tropical Ecology Working Group at the Max-Planck-Institute for Limnology at Plön/Germany, and his colleagues, are described.

The area studied was the Adolpho Ducke Forest Reserve located 26 km north-east of Manaus (02°55'S, 59°59'W). The arthropods were sampled by fogging the canopies of two tree species: (1) In the undisturbed rain forest two specimens of *Goupia glabra* (Celastraceae, common name "Cupiuba") were fogged, namely tree no. 59 with 45 m height and no. 64 with 38 m height; (2) in a forest plantation some specimens of *Calo-*

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phyllum brasiliense (Guttiferae, common name "Jacareúba") were fogged which had a height of about 10 m (for details of forests and methods see ADIS et al. 1998; HARADA & ADIS 1998).

The holotypes and the majority of the paratypes have been deposited at the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus/Brazil. The other paratypes are in the author's collection.

The whole collection of Collembola Symphypleona contained 45 specimens which are distributed among the samples as follows:

Cupiuba (*Goupia glabra*) tree no. 59:

Sample C-59-22.VIII.1991 (without Symphypleona);
sample C-59-23.II.1992 (*Sturmius truncivivus* BRETFELD & GAUER, 2000, 1 female);
sample C-59-26.VIII.1992 (*Adisius maculatus* n.g. n.sp. 5 specimens, *Sphyrotheca coeruleocapitata* n.sp. 1 male);
sample C-59-26.VII.1994 (*Adisius maculatus* n.g. n.sp. 4 specimens).

Cupiuba (*Goupia glabra*) tree no. 64:

Sample C-64-26.VIII.1992 (*Arborianna cupiubae* n.g. n.sp. 20 specimens, *Sminthurinus* cf. *aureussetosus* n.sp. 1 juvenile, *Sphaeridia bivirgata* n.sp. 1 male, *Sphyrotheca caputalba* n.sp. 1 female, *Sturmius truncivivus* 1 female);
sample C-64-27.VII.1994 (*Adisius fuscus* n.g. n.sp. 1 male, 1 juvenile, *Arborianna cupiubae* n.g. n.sp. 5 specimens, *Sphaeridia duckei* n.sp. 1 female).

Jacareúba (*Calophyllum brasiliense*):

Sample 21.II.1992 (*Sminthurinus aureussetosus* n.sp. 1 female, *Sphyrotheca caputalba* n.sp. 1 male).

Description

Adisius n.g.

Type species. *Adisius maculatus* n.sp.

Diagnosis. A genus of the monophylum Bourletiellida BRETFELD, 1986 (syn. Bourletiellidae BÖRNER, 1913), with the following diagnostic characteristics:

Large abdomen elongate. Head, antennae and abdomen with rough and blunt spinelike and normal setae; furca base with 1+1 neosminthuroid setae. Mouthparts normal. Antennae shorter than body, segment IV with a long row of dorso-posterior sensilla, large sensillum P on 1st whorl behind tip, and with 5 or 2 ventral sensilla. Coxa II and III with 1 short spiny seta each. Each tibiotarsus with acuminate setae, without toothed or obliquely truncated ones. Tibiotarsus I-III with 3, 3, 2 spatulate setae respectively, and each with 1 oval organ and seta IIi; tibiotarsus I seta Ja appressed. Empodia short and pointed, without separate filaments, length < claws. Number of anterior setae of dens reduced, formula 4, 0-1...1. Male with a secondary sexual characteristic in a transformed ventro-distal seta of antennal segment III.

Derivatio nominis. This new genus is named after Prof. Dr. Joachim ADIS, Plön/Germany, who untiringly studies the biology of Arthropoda of the tropical forests of Brazil, research which includes the possibility of discovering strange new taxa such as described here. - The gender of this new genus is masculine.

Justification. *Adisius* n.g. differs from all known genera of the Bourletiellida by its neosminthuroid setae. It appears in the key to the genera of the Bourletiellida (BRETFELD 1999) near *Deuterosminthurus* BÖRNER, 1901 and *Arlesminthurus* BRETFELD, 1999, but differs from these genera (in addition to the presence of neosminthuroid setae)

by the reduced number of anterior setae of the dentes.

Spines and neosminthuroid setae are reminiscent of the Sphyrothecinae and Katiannida. The presence of the antennal sensilla and the five bothriotrichia show that this genus belongs to the Bourletiellida.

In several species of the Bourletiellida, the males possess head spines as secondary sexual characteristics. *Adisius*, however, has spines on the head and abdomen in both sexes and the juveniles. Only the genera *Stenognathriopes* BETSCH & LASEBIKAN, 1979, and *Tenentiella* (PALACIOS-VARGAS & VAZQUEZ, 1997) also have such spines, but they differ from the new genus by their lengthened mouthparts, or large spatulate setae of tibiotarsi, respectively. Thus for the two species described below, a new genus had to be introduced.

For a discussion of other species that may belong to this new genus, see below under Remarks on the second new species.

With the discovery of neosminthuroid setae in the Bourletiellida, there remain, in the Symphypleona, only the Sminthuridida without such setae. Thus, the unity of the Symphypleona BÖRNER, 1901 (including the Neelida) as a distinct monophylum is again demonstrated by the presence of these setae, which are never found in the Arthropleona (BRETFELD 1986, 1999).

Adisius maculatus n.sp.

Holotype. Male (in alcohol, at INPA), Brazil, Amazonas, terra firme, Adolpho Ducke Forest Reserve near Manaus, canopy fogging of Cupiuba tree no. 59, sample C-59-26.VII.1994 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 4b).

Paratypes. 1 male, 2 juveniles (in alcohol and on slides, at INPA and in author's coll.) together with the holotype. - 5 juveniles (in alcohol and on slides, at INPA and in author's coll.), fogging the same tree as in the holotype but sample C-59-26.VIII.1992 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 3a).

Derivatio nominis. The name of this new species is derived from its colour pattern.

Diagnosis. A small, light looking species of the genus *Adisius* BRETFELD, see above, with 5 diagnostic characteristics:

- Head with 1+1 longitudinal stripes,
- dorsal side of large abdomen with an irregular dark patch,
- head frons with 4+4 rough and blunt spinelike setae,
- antennal segment IV with 5 ventral sensilla,
- formula of anterior setae of dens 4,1...1.

Other diagnostic characteristics as mentioned for the genus.

Description. Since an adult female is not present in the samples, the measurements and descriptions are mainly based on the preparations of one adult male and one subadult female.

Measurements and proportions from 1 adult male (and 1 subadult female in brackets). Total length 0.5(0.56) mm; head 0.23(0.25) mm; mucro 70(75) µm; inner edge of claw III 20(21) µm. Length of antennae:head diagonal = 1.9(1.7); antennal segments I:II:III:IV = 1:1.9(1.7):3.5(2.7):6.5(5.3); dens:mucro = 2.4(2.6); mucro:claw III inner edge = 3.4(3.6); spine between bothriotrichia AB:mucro = 0.46, this spine to that behind bothriotrichia AB = 0.6 (Fig. 2).

Colour (Fig. 1). Eye-patches black; background colour of head and body whitish with a pattern of bluish or brown violet pigment. Head with 1+1 pigmented bands from

behind the eye-patches to clypeus; large abdomen with more or less intense violet shades or small flecks on lateral and ventral sides and an irregular large patch on dorsal side, this patch not present in small juveniles; antennae violet or brown, tibiotarsi with 2-3 pigmented spots, furca unpigmented or violet.

Chaetotaxy and special structures. The general chaetotaxy is that usually found in the Bourletiellida (BRETFELD 1990, 1999). Dorsal parts of head and lateral and dorsal parts of abdomen with rough and blunt spinelike and normal setae (Figs. 2, 3).

Head (Figs. 3, 4). Eye-patches with 8+8 ommatidia, D much smaller than others, 2+2 setae; dorsal parts of head with 7+7 spinelike setae (4+4 of frons, 1+1 ventral setae of eye-patches, 1+1 of apex, pair no. 1 of dorsal head-back); ventral parts only with normal setae, region M with 7-8 setae, in male those of clypeus shorter than of lateral parts; ventral head-back with 2+2 oval organs; mouthparts normal.

Antennae. Total length shorter than body. Segment I (Fig. 4) with 7 setae as usual, in male with seta no. 3 thicker than others; segment II (Fig. 5) whorls 1-4 with 2, 4, 4, 9 setae respectively, with seta 2/2 thicker than others and seta 4/3 rough (in subadult female the distal part of this seta apparently broken); segment III (Figs. 6-8) whorls 1-9 with 1, 5, 0, 6, 5, 7, 4, 3, 6 setae respectively, with seta 2/1 and 4/3 rough and blunt, in male the ventro-distal seta 9/2 as a short and thick spine; segment IV (Fig. 9) with usual sensilla of basal whorl p1, intermediate region T with 22 setae in male (17 in subadult female), distal part with about 5 short subsegments, basal and distal parts in male with 7 dorso-anterior sensilla (including 2 large distal ones), 9-10 dorso-posterior sensilla (including 1 large distal one) and 5-6 ventro-posterior sensilla (including 2 large distal ones, all ventral sensilla already in 1st instar juveniles) (in subadult female only 7 dorso-posterior sensilla but all others present); tip sensilla not analysed.

Large abdomen. General form elongate (Figs. 2, 10, 13), with rough and blunt spinelike and shorter normal setae, 3+3 long spines anterior to bothriotrichia AA, spine between bothriotrichia AB shorter than that behind AB, a thin sensillum dorsal to furca base, each furca base (Fig. 11) with 2 rough spines besides normal setae, and 1 rough neosminthuroid seta with a short basis. Ventral tube with 1+1, retinaculum 3, ventral region 3+4 setae.

Small abdomen. Dorsal and lateral parts with rough and blunt spinelike, 1+1 smooth spinelike, and normal setae (Figs. 2, 12, 13). Segment V with 2+2 long lateral and 2+2 short dorsal spines; genital papilla in male with 4+4 setae, 3 pairs of which strong, the most posterior strong pair with thin tips, lateral to genital papilla with a pair of long cuticular invaginations which may be glandular ducts (Fig. 12, not yet observed in other species of the Bourletiellida); genital papilla in subadult female with 2+2 short setae. Segment VI (Figs. 12, 13) with the same pattern as usual but in male with a reduced number of setae; dorsal anal valve without median setae m in male (2 in subadult female), with 1+1 DL setae in male (2+2 in subadult female), 2+2 P setae in both sexes (the dorsal pair smooth and spindle shaped), only a0 in male (a0, a1-3 in subadult female), and 1+1 oval organs in subadult female; ventral anal valves in male not analysed, in subadult female with 6+6 circumanal setae (av1', av1-av5, appendices anales av5 not completely developed), 1+1 oval organs in both sexes.

Legs. Coxa II and III (Fig. 14) each with setae no. 1 as short spine like in oval organ (already in 1st instar juvenile). Trochanter I (Fig. 15) with 2 normal and 2 short setae. Femur III without secondary setae p5 and m6 and without distal seta d7. Tibiotarsi I-III with thick and rough inner setae, longest outer setae ≥ diameter of tibiotarsus,

rows p with 7, 5, 2 setae and distal parts with 3, 3, 2 spatulate setae respectively, each tibiotarsus with 1 oval organ 2pe, with seta IIi but without seta Ii, all other distal setae present, tibiotarsus I seta Ja winged (Fig. 16). All claws and empodia of same shapes (Fig. 16), claws slender in male (broader in subadult female) with small distal inner tooth in both sexes; empodia short and pointed without separate filaments, length < claws.

Furca. All setae normal. Manubrium with 8+8 setae; setae of dentes in male thinner than in subadult female, only the 3 antero-distal setae thicker than others in both sexes (Fig. 17); outer row E with 8, inner row J with 5-7, postero-outer row PE with 1, posterior row P with 7 setae, formula of anterior setae 3+1,1...1 (all anterior setae already in 1st instar juvenile); mucro (Fig. 17) broad with distinct point, anterior furrow narrow, seta missing.

Remarks. See below with the second species of this genus.

Adisius fuscus n.sp.

Holotype. Male (on 4 slides, at INPA), Brazil, Amazonas, terra firme, Adolpho Ducke Forest Reserve near Manaus, canopy fogging of Cupiuba tree no. 64, sample C-64-27.VII.1994 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 4a).

Paratype. One 1st instar juvenile (on slide, at INPA) together with the holotype.

Derivatio nominis. The name of this new species is derived from its brown colour.

Diagnosis. A small, dark looking species of the genus *Adisius* BRETFELD, see above, with 4 diagnostic characteristics:

- Head and body with brown pigment, dorsal parts of head and large abdomen paler,
- head frons with 3+3 rough and blunt spinelike setae,
- antennal segment IV with 2 ventral sensilla,
- formula of anterior setae of dens 4...1.

Other diagnostic characteristics as mentioned for the genus.

Description. Since an adult female is not present in the samples, the measurements and descriptions are based on the preparations of the holotype male.

Measurements and proportions. Total length 0.55 mm; head 0.23 mm; mucro 70 µm; inner edge of claw III 30 µm. Length of antennae : head diagonal = 1.9; antennal segments I:II:III:IV = 1:1.6:2.7:4.9; dens:mucro = 2.7; mucro:claw III inner edge = 2.1; spine between bothriotrichia AB:mucro = 1, this spine to that behind bothriotrichia AB = 1.2.

Colour (Fig. 18). Eye-patches black; background colour of head and body yellow with brown to black pigment. Lateral parts of head and body brown with small pale spots, posterior part of large abdomen and dorsal side of small abdomen blackish, dorsal sides of head and of large abdomen with only a few brown spots and a stripe on heart region (1st instar juvenile with some bluish pigment on head-back and large abdomen).

Chaetotaxy and special structures. The general chaetotaxy is that usually found in the Bourletiellida (BRETFELD 1990, 1999). Dorsal parts of head and lateral and dorsal parts of abdomen with rough and blunt spinelike and normal setae (see Fig. 2).

Head (Fig. 19). Eye-patches with 8+8 ommatidia, D much smaller than others, 2+2 setae; dorsal parts of head with 8+8 spinelike setae (3+3 of frons, 1+1 ventral setae of eye-patches, 1+1 of apex, all 3+3 of dorsal head-back); ventral parts only with normal setae, region M with 7-8 setae, clypeus with some setae longer than others; ventral head-back with 2+2 oval organs; mouthparts normal.

Antennae. Total length shorter than body. Segment I (Fig. 19) with 7 setae as usual, seta no. 2 thicker than others, rough and blunt; segment II whorls 1-4 with 2, 4, 4, 9 setae respectively, with seta 4/3 long and rough (see Fig. 5); segment III (see Figs. 6, 7) whorls 1-9 with 1, 5, 0, 6, 5, 7, 4, 3, 6 setae respectively, with seta 4/3 rough and blunt and the ventro-distal seta 9/3 as a short and fringed spine (Fig. 20); segment IV (Fig. 21) with usual sensilla of basal whorl p1, intermediate region T with 14 setae, distal part with about 4 short subsegments, basal and distal parts with 7 dorso-anterior sensilla (including 2 large distal ones), 8-9 dorso-posterior sensilla (including 1 large distal one) and 2 large ventro-posterior sensilla (all ventral sensilla already in 1st instar juvenile); tip sensilla not analysed.

Large abdomen. General form elongate (see Fig. 2), with rough and blunt spinelike and shorter normal setae, 3+3 long spines anterior to bothriotrichia AA, spine between bothriotrichia AB longer than that behind AB, a thin sensillum dorsal to furca base, each furca base with normal and 1 rough neosminthuroid seta with a short basis (see Fig. 11). Ventral tube with 1+1, retinaculum 2, ventral region 3+4 setae.

Small abdomen. Dorsal and lateral parts with rough and blunt spinelike, 1+1 smooth spinelike, and normal setae (see Fig. 2). Chaetotaxy of segment V not analysed; genital papilla large and protruding with 6+6 normal setae, 1+1 of which strong (Fig. 22); cuticular invaginations lateral to genital papilla missing. Segment VI (Fig. 22) with the same pattern as usual but with a reduced number of setae; dorsal parts without median setae m, with 1+1 DL setae, 2+2 P setae (the dorsal pair smooth and spindle shaped), and only a0 (oval organs not observed); ventral parts as usual and with 1+1 oval organs.

Legs. Coxa II and III (see Fig. 14) each with setae no. 1 as short spine like in oval organ (already in 1st instar juvenile). Trochanter I with 2 normal and 2 short setae (see Fig. 15). Femur III without secondary setae p5 and m6 and without distal seta d7. Tibiotarsi I-III with thick and rough inner setae, longest outer setae >> diameter of tibiotarsus, rows p with 7, 5, 2 setae and distal parts with 3, 3, 2 distal spatulate setae respectively, each tibiotarsus with 1 oval organ 2pe, with seta IIi but without seta Ii, all other distal setae present, tibiotarsus I seta Ja winged (see Fig. 16). All claws and empodia of same shapes (see Fig. 16), claws slender with small distal inner tooth; empodia short and pointed without separate filaments, length < claws.

Furca. All setae normal. Manubrium with 8+8 setae; setae of dentes thin, only the 3 antero-distal setae thicker than others (see Fig. 17); outer row E with 8, inner row J with 7, postero-outer row PE with 1, posterior row P with 7 setae, formula of anterior setae 3+1...1 (all anterior setae already in 1st instar juvenile); mucro (see Fig. 17) broad with distinct point, anterior furrow narrow, seta missing.

Remarks. These two species of *Adisius* are relatively small, the adults of which show a specific colour pattern. The colours in the juveniles are similar, but the juveniles differ, as early as the 1st instar, by the ventral sensilla of their antennal segment IV and the anterior setae of their dentes. Beside their colour differences, the males differ also in their head spines, in the shape of their genital papilla, and in the ventro-distal seta of their antennal segment III. The adult females of both species are unknown.

One already described species also belongs to this new genus, *Adisius maassius* (PALACIOS-VARGAS & GONZALEZ, 1995) n.comb. (syn. *Deuterosminthurus maassius*) from a dry tropical forest of Mexico. This species was also collected by fogging trees. It has spinelike setae on the head and abdomen, few anterior setae of the dentes, and short, acuminate empodia. I was able to study two paratype females, and can add

the following observations to the original description.

Material. 2 females (each on one slide), no. 1 labelled "18. VIII. 92, Mex. Jal. Chamela, Cuenca 4A, Fumigación; Bourletiellidae, *Deuterosminthurus*, No.1, adulto female", no. 2 labelled "18.VIII.92, Mex. Jal. Chamela, Cuenca 4A, Fumigación, E3; Bourletiellidae, *Deuterosminthurus*, female"; I added "(1)" and "(2)" and on both slides "*maassius*, Paratype".

Description. Head and body dark blue, extremities unpigmented. Spinelike setae of head and body almost smooth, pointed. Dorsal parts of head with about 11+11 spinelike setae (5+5 of frons with additional 3-4 more ventral pairs also thicker than normal setae, 1+1 ventral setae of eye-patches, 2+2 of apex, all 3+3 of dorsal head-back). Antennal segments I-III without a thick seta (may be lost, segment II and III apparently with 1 basal large socket each); segment IV with 7 dorso-anterior sensilla, 9-10 dorso-posterior sensilla and 2 ventral sensilla. Number and proportions of spines of anterior part of large abdomen not observable, apparently the longest spines on the posterior of large abdomen (ratio to mucro = 0.65), 1+1 neosminthuroid setae present (not mentioned in the original description). Dorsal anal valve (Fig. 23) with strong circumanal setae, a0 and a1 short, a2 and a3 the thickest and longest (ratio to mucro = 0.75), 2+2 P setae also long and strong; ventral anal valves with 6+6 circumanal setae av1', av1-av5, appendices anales (= av5, Figs. 23, 24) long and strong with tip round or pointed (ratio to mucro = 0.65). Coxa II and III with one short spinelike seta each like in oval organ, trochanteres without a special seta and without large oval organs, femur III with short posterior setae as usual (in the original description mentioned as being absent), inner and distal setae of tibiotarsi thicker and longer than others, number of clavate setae not observed with certainty. All claws and empodia of same shapes, claws with small distal inner tooth, lateral teeth not observed, empodia short and pointed as described above with the new species. Dentes outer row E with 8, inner row J with 7-8 setae, formula of anterior setae 3+1,1(very short)...1, mucro as originally described and with distinct point as in the new species.

These observations show that *Adisius maassius* n.comb. does not belong to *Deuterosminthurus* but is correctly enclosed in the new genus. It does not represent a female of one of the new species since the colour, the form of the spinelike setae and the number of the spiny head setae clearly differ. The genus *Deuterosminthurus* is Holarctic (BRETFELD 1999) and does not occur in the tropics. Therefore most of the *Deuterosminthurus* species mentioned in the key by PALACIOS-VARGAS & GONZALEZ (1995) belong to other genera (*Arlesminthurus* BRETFELD, 1999, *Prorastriopes* DELAMARE-DEBOUTTEVILLE, 1947, and I suppose other new genera).

Whether *Deuterosminthurus tristani* DENIS, 1933, collected from trees or bushes in Costa Rica, also belongs to *Adisius*, can only be proved by further studies.

Arborianna n.g.

Type species. *Arborianna cupiubae* n.sp.

Diagnosis. A genus of the monophylum Katiannida BRETFELD, 1999 (syn. Katiannidae BÖRNER, 1913 a. p.), with the following diagnostic characteristics:

Large abdomen elongate, head with short spinelike setae, male with simple thorax, abdominal segment V separated from large abdomen; furca base with 1+1 neosminthuroid setae. Ventral head-back without a spur. Mouthparts normal. Antennal segment III with a papilla, segment IV undivided. Tibiotarsi without basal pores. Large abdomen

with normal setae, bothriotrichia ABCD present, ABC form an obtuse angle opening to the anterior, A and B are close to one another, D lies on a normal socket. Ventral tube with smooth sacs. In female, circumanal seta a0 unforked, other circumanal setae unwinged.

Derivatio nominis. This new genus is named after its habitat, the canopy of trees. The gender is feminine.

Justification. This new genus appears in the key to the genera of the Katiannida (BRETFELD 1999) near *Katianna* BÖRNER, 1907 and *Polykatianna* SALMON, 1946. It differs, however, from these genera in several features (head with short setae, antennal segment IV undivided, neosminthuroid setae present, furca base with 7 thick setae, see Table 1) and thus is justified as a new genus.

Arborianna cupiubae n.sp.

Holotype. Male (in alcohol, at INPA), Brazil, Amazonas, terra firme, Adolpho Ducke Forest Reserve near Manaus, canopy fogging of Cupiuba tree no. 64, sample C-64-27.VII.1994 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 4a).

Paratypes. 1 juvenile male, 3 other juveniles (in alcohol and on slides, at INPA and in author's coll.) together with the holotype. - 1 female, 2 males, 17 juveniles (in alcohol and on slides, at INPA and in author's coll.), fogging the same tree as for the holotype but sample C-64-26.VIII.1992 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 3b).

Derivatio nominis. The name of this new species refers to the tree species (*Goupia glabra*, common name "Cupiuba") from which it has been collected.

Diagnosis. A small, light looking species of the genus *Arborianna* BRETFELD, see above, with 4 diagnostic characteristics:

- Violet to brown pigment mainly in lateral spots,
- tibiotarsi distally with 5-6 spatulate setae,
- claws with inner and posterior teeth,
- mucro with both posterior edges smooth.

Other diagnostic characteristics as mentioned for the genus.

Description. Measurements and proportions from 1 female (and 1 male in brackets). Total length 0.8(0.6) mm; head 0.25(0.18) mm; mucro 56(43) µm; appendices anales 39 µm; inner edge of claw III 30(27) µm. Length of antennae:head diagonal = 1.9(2.0); antennal segments I:II:III:IV = 1:1.8:2.5:5.3 in both sexes; manubrium:dens:mucro = 4: 3:1(3.4:2.9:1); appendices anales:mucro = 0.7; appendices anales:claw III inner edge = 1.3; mucro:claw III inner edge = 1.8(1.6).

Colour (Fig. 25). Eye-patches black; background colour of head and body white with violet or more seldom brown spots mostly in 1+1 lateral rows from below the eye-patches to small abdomen, the spots becoming more intense towards the posterior. Small abdomen with dark spots on lateral and dorsal parts. In some specimens more pigment also on head-back and head-sides. Antennae more or less violet, legs and furca unpigmented.

Chaetotaxy and special structures (applied to both sexes if not otherwise stated). Dorsal parts of head with short, spinelike setae, other parts of head with normal but stout setae (Fig. 26); large abdomen mostly with short setae, but postero-lateral sides with longer ones, the 2+2 longest in front of segment V (Fig. 31); male abdominal segment VI with blunt dorsal setae (Fig. 31), female with normal ones.

Head (Fig. 26, Table 2). Eye-patches with 8+8 ommatidia, D apparently the smallest (obscured by pigment), 2+2 setae; dorsal parts of head with 2+2 spinelike and short normal setae (frons rows a with 4, b with 4 setae with pair a4 spiny, apex with 2+2 setae with inner pair spiny, dorsal head-back with 3+3 setae), ventral of setal pair a1 with 3+3 cuticular pores; ventral parts of head with varying region M (4-8 setae) and with 7 cross rows a-g as usual with only slight differences (setal pair f2 between rows f and g); no oval organs; mouthparts normal.

For comparison of the head chaetotaxy, that of 5 species of the group of *Sminthurinus aureus* and 4 species of the group of *Sminthurinus niger* have been studied (Figs. 40, 41, Table 2). The main pattern is the same as in the new species and the setal pair f2 has the same position. The main differences between the groups are that the *niger*-group has more setae and that row f has 10+10 setae, i.e. there are 2+2 median setae of ventral head-back (instead of 1+1). In the new species, the dorsal parts resemble those of the *aureus*-group with a missing median seta of the apex, whereas the ventral parts show an intermediate position between the *aureus*- and *niger*-group.

Antennae. Segment I with 7 setae (as in *niger*-group, *aureus*-group with only 5 setae); segment II (Fig. 27) whorls 1-3 with 2, 4, 8 setae respectively (*aureus*-group with 2, 4, 7 (Fig. 42), *niger*-group with 2, 5, 8 setae respectively); segment III (Fig. 27) lengthened with undivided papilla and about 4 setal regions with 5, 3, 10, 6 setae respectively (*aureus*-group with 8, 6 (Fig. 42), *niger*-group related to species with 5, 2-3, 6-10, 6 setae respectively), the distal whorl or region with 3 sensilla as usual; segment IV undivided with about 14 setal whorls with 9 dorso-anterior sensilla (including 2 large distal ones), 11 dorso-posterior sensilla (including 1 large distal one), 2 ventro-posterior sensilla, and 12 short tip sensilla (*aureus*-group with about 12 setal whorls and 6, 6-7, 0 sensilla respectively, *niger*-group related to species with 12 setal whorls and 8-9, 9, 2 sensilla respectively, in both groups tip sensilla not analysed).

Large abdomen. Chaetotaxy not analysed, bothriotrichia AB close to one another with adjacent short setae (Fig. 28), posterior margin above segment V with 2+2 long setae (Fig. 31), each furca base (Fig. 29) with 8 stout setae, the most anterior of which is a not appressed neosminthuroid seta with an oval basis. Distal valves of ventral tube with 2+2, anterior lobe of retinaculum 2 (Fig. 30), ventral region 2+2 setae.

Small abdomen. Segment V (only analysed in male, Figs. 31, 32) with 6 setae around each bothriothrix D; genital papilla in female with 10 setae, in male about 13+13 setae. Segment VI in female (Figs. 33, 34) with dorsal setae acuminate and slightly stouter than others, 7 simple dorsal circumanal setae (a0, a1-a3) and 6+6 ventral ones (av1', av1-av5), appendices anales (= av5, Figs. 33, 35) long and slender, tip bent to the dorsal and with short fringes; male with blunt dorsal and lateral, and long ventral setae (Figs. 31, 32).

Legs. Basal segments (Fig. 36): Coxa I-III with 1, 3, 2 (+ oval organ) setae respectively, coxa II and III additionally with 1 pore each, no cuticular cones present. Trochanter I-III with 4, 4 (+ oval organ), 4 (+ oval organ) setae respectively. Femur I-III with 12, 12, 13 setae respectively. Tibiotarsi I-III (Fig. 37) without secondary setae (see NAYROLLES 1988), with 5-7 distal clavate setae; basal setal whorl V differently developed, in tibiotarsus I all setae present but Vai and Vpi reduced to oval organs, in tibiotarsus II seta Vp missing and Vai and Vpi reduced to oval organs, in tibiotarsus III seta Vp missing, Vai normal and Vpi as a short and appressed seta. All claws of same shape (Fig. 38) with 2 small distal inner teeth, 1-2 antero-lateral and several postero-

lateral teeth; all empodia slender and pointed (Fig. 38) with outer tooth, filaments I and II short, stout and pointed, length of filament I > II, filament III missing, all empodia not exceeding claws.

Furca. All setae normal (Fig. 39). Manubrium with 8+8 setae; dens in both sexes with an apical whorl of 7 setae, with 0-1 anterior subapical setae and with posterior setae: 5 proximal, and 3 outer and 3 median subapical setae (subadult male without anterior subapical setae and posterior setae: 3 proximal, and 2 outer and 3 median subapical setae); mucro (Fig. 39) in a straight position (not laterally spread as in *Sminthurinus*), slender and smooth with distinct point, seta missing.

Sminthurinus aureussetosus n.sp.

Holotype. Female (on 4 slides, at INPA), Brazil, Amazonas, terra firme, Adolpho Ducke Forest Reserve near Manaus, canopy fogging of Jacareúba tree, sample 21.II.1992 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 5). No paratypes known.

Further specimen (not included in the type series). 1 juvenile (on slide, at INPA), Brazil, Amazonas, terra firme, Adolpho Ducke Forest Reserve near Manaus, canopy fogging of Cupiuba tree no. 64, sample C-64-26.VIII.1992 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 3b).

Derivatio nominis. The name of this new species is derived from the chaetotaxy of its dentes which is the same as in the *Sminthurinus aureus* group of species.

Diagnosis. A small, dark looking species of the genus *Sminthurinus* BÖRNER, 1901, belonging to the *Sminthurinus niger* group of species, with 5 diagnostic characteristics:

- Pigmentation blackish blue with pale spots,
- apex of head with 2+2 setae,
- circumanal seta a0 forked, most other circumanal setae winged,
- chaetotaxy of dentes as in the *Sminthurinus aureus* group of species (see below),
- both posterior edges of mucro serrate.

Description of the holotype female. Measurements and proportions. Total length 0.6 mm; head 0.2 mm; mucro 45 µm; appendices anales 26 µm; inner edge of claw III 22 µm. Length of antennae:head diagonal = 1.6; antennal segments I:II:III:IV = 1:1.8:2.5 :4.6; manubrium:dens:mucro = 2.7:2.1:1; appendices anales:mucro = 0.6; appendices anales:claw III inner edge = 1.2; mucro:claw III inner edge = 2.

Colour. Eye-patches black; background colour of head and body white with blue to blackish pigment. Dorsal parts of head blue with white spots, ventral parts white. Dorsal parts of large and small abdomen dark, ventral parts white with blue spots, dorsal side of large abdomen with 1+1 small pale spots. Antennae blue, legs pale blue, furca unpigmented.

Chaetotaxy and special structures. Head and body with short normal setae, neosminthuroid setae present, circumanal setae modified.

Head (Fig. 43). Eye-patches with 8+8 ommatidia, D much smaller than others, 2+2 setae; apex of head with 2+2 setae, others parts as in *Sminthurinus niger* group (see Figs. 40, 41), cuticular pores and oval organs uncertain; mouthparts normal.

Antennae. Segment I with 5 setae (as in *aureus*-group); segment II whorls 1-3 with 2, 5, 8 setae respectively (as in *niger*-group); chaetotaxy of segment III and IV uncertain and not analysed, papilla of segment III small but protruding.

Large abdomen. Chaetotaxy not analysed, neosminthuroid seta rough with a long basis (Fig. 44). Distal valves of ventral tube with 2+1, anterior lobe of retinaculum 2,

ventral region 3+3 setae.

Small abdomen. Chaetotaxy not analysed. Segment V separated from large abdomen. Segment VI (Fig. 45) with long dorsal pair of P setae, dorsal circumanal seta a0 forked, most other circumanal setae winged. Appendices anales (Fig. 45) broad with tip split into about 6 branches.

Legs. Coxa I-III with 1, 3, 2 (+ oval organ) setae respectively. Trochanter I-III with 4, 4 (+ oval organ), 4 (+ oval organ) setae respectively. Femur I-III with 12, 13, 13 setae respectively. Tibiotarsi I-III with inner setae thicker than others, all tibiotarsi with 5 distal clavate setae but without oval organs; in tibiotarsus I all setae present, in tibiotarsus II seta Ip and Vp missing, in tibiotarsus III seta Ip present, setae IVp and Vp missing. All claws (Fig. 46) of same shape with 1 outer and 2 small distal inner teeth, without lateral teeth; all empodia with outer tooth, empodium I (Fig. 46) with straight filament and length ≤ claw, empodium II and III without filament and length < claws.

Furca. All setae normal. Manubrium with 7+6 setae; chaetotaxy of dentes (Fig. 47) as in *Sminthurinus aureus* group of species: Apical whorl with 7 setae, without anterior subapical setae and with posterior setae: 3 proximal, and 1 outer and 3 median subapical setae; mucro (Fig. 47) slender and pointed with both posterior edges serrate, seta missing.

Remarks. *Sminthurinus aureussetosus* n.sp. clearly belongs to the *Sminthurinus niger* group (abdominal segment V separated from the large abdomen, both posterior edges of mucro serrate, many head setae), but its antennal segment I and its dentes have the chaetotaxy of the *Sminthurinus aureus* group.

From the species known to me, none of the *Sminthurinus niger* group (and particularly no *Sminthurinus* species described from South America) have the same chaetotaxy of the dentes.

Short description of the further juvenile specimen. Total length 0.26 mm. Colour blue with white spots on head and abdomen, subsegments of antennae with blue distal parts. Head (as in *niger* group) with apex 2+2, frons rows a:6+6, b:5+5, rows f of clypeus 10+10 setae. Antennal segment III with a small papilla, segment IV undivided. Neosminthuroid setae with long basis and free tip. Abdominal segment V separated from segment VI, the latter with normal setae, all circumanal seta simple. All tibiotarsi with 5 distal clavate setae, all claws with small inner tooth, empodia I and II with filaments, length of filament I > II, filament III missing. Manubrium with 5+5 setae; dentes without anterior subapical setae and posterior setae: 3 proximal, 1 outer and 3 median subapical setae; posterior edges of mucro with uncertain teeth, tip pointed.

This specimen may belong to *Sminthurinus aureussetosus* n.sp., as the colour and most of the chaetotaxy is similar, but because of the few characteristics observed I do not regard it as a paratype.

Sphaeridia bivirgata n.sp.

Holotype. Male (on 3 slides, at INPA), Brazil, Amazonas, terra firme, Adolpho Ducke Forest Reserve near Manaus, canopy fogging of Cupiuba tree no. 64, sample C-64-26.VIII.1992 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 3b). No further specimens known.

Derivatio nominis. The name of this new species refers to its colour pattern of two cross stripes.

Diagnosis. A species of the genus *Sphaeridia* LINNANIEMI, 1912 with 3 diagnostic

characteristics:

- Large abdomen with two broad, blue cross stripes,
- posterior side of ventral tube with a median process and a pair of toothed processes,
- setae of ventral tube curved S-like.

Description. Total length 0.18 mm. Large abdomen with two broad, blue cross stripes, antennal segments III and IV also blue. Head and abdomen only with normal setae. All setae of head frons present. Antennae with simple spines as usual with 4 long sensilla in segment II and 6 in segment III. Posterior side of ventral tube (Fig. 48) with a short and blunt median process and a pair of processes with 3 teeth each, lateral parts with several small processes, setae curved S-like. Tibiotarsus III (Fig. 49) seta IIpe long and acuminate, seta IIIpi acuminate with a strong tooth, seta IVpi thicker than normal setae. Claws, empodia and furca as in *Sphaeridia pumilis* KRAUSBAUER, 1898, except that there are only 2 distal setae of dens thickened, E1 and J1.

Remarks. Because of the median process of its ventral tube, *Sphaeridia bivirgata* belongs to the *brevipila*-group of *Sphaeridia* species (BRETFELD & GAUER 1994), but all known species differ from the new one.

Sphaeridia duckei n.sp.

Holotype. Female (on slide, at INPA), Brazil, Amazonas, terra firme, Adolpho Ducke Forest Reserve near Manaus, canopy fogging of Cupiuba tree no. 64, sample C-64-27.VII.1994 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 4a). No further specimens known.

Derivatio nominis. This new species is named in honour of the botanist Adolph DUCKE (27.X.1876-5.I.1959), who extensively studied the Amazonian flora and after whom the Forest Reserve is named.

Diagnosis. A species of the genus *Sphaeridia* LINNANIEMI, 1912 with 3 diagnostic characteristics:

- Body white with several blue regions,
- tibiotarsi I-III with 2 distal spatulate setae each,
- tibiotarsus III with a third spatulate and a thick and hooked distal seta.

Description. Measurements and proportions. Length of head 0.125 mm; mucro 30 µm; inner edge of claw III 19 µm. Length of antennae : head diagonal = 1.3; antennal segments I:II:III:IV = 1:1.4:1.3:3; dens:mucro = 2.3; mucro:claw III inner edge = 1.6.

Colour. Eye-patches black; background colour white with blue pigment; head back, lateral and ventral parts of large abdomen, and small abdomen dark blue, frontal eye and mouth dark, other parts of head and dorsal side of large abdomen and extremities unpigmented.

Chaetotaxy and special structures. Head and abdomen only with normal setae. Dorsal parts of head with chaetotaxy as in *Sphaeridia pumilis* KRAUSBAUER, 1898, ventral parts not analysed. Antennal segment IV with narrow tip as in other *Sphaeridia* species. Bothriotrichia ABC in equal distances and apparently forming a straight line; genital papilla without setae but opening present; circumanal setae not modified, appendices anales absent. Femur I (Fig. 50) with 2 short spinelike setae directed towards the posterior as in other *Sphaeridia* species; outer side of tibiotarsi I-III (Figs. 51-53) with 2 spatulate distal setae each, outer side of tibiotarsus III with a third spatulate seta and a thick distal seta with hooked tip. Claws (Figs. 51, 53) long and slender with inner

tooth, claw III also with small outer teeth; empodia (Figs. 51, 53) slender, empodia I and II with thick filament, empodium III broader and flame-shaped without filament, all empodia not exceeding claws. Furca (Fig. 54): Manubrium with 3+3 normal and 1+1 strong setae; dentes with fewer setae than in *Sphaeridia pumilis*, outer row E with 5, inner row J with 3, posterior row P with 5 setae, formula of anterior setae 2,2,1...1, inner setae only slightly thicker than others; mucro slender and pointed, without a seta and apparently without teeth.

Remarks. This single female shows many characteristics of the genus *Sphaeridia* although there are some differences: The straight line of the bothriotrichia ABC, the smooth and pointed mucro, and especially the distal setae of the tibiotarsi have never been found in this genus before and should be restricted to a male. In spite of these strange features I regard this female to belong to *Sphaeridia* until a corresponding male is known which may have antennal characteristics different from this genus.

Sphyrotheca caputalba n.sp.

Holotype. Female (on 3 slides, at INPA), Brazil, Amazonas, terra firme, Adolpho Ducke Forest Reserve near Manaus, canopy fogging of Cupiuba tree no. 64, sample C-64-26.VIII.1992 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 3b).

Paratype. Male (on 3 slides, at INPA), same locality as the holotype but canopy fogging of Jacareúba tree, sample 21.II.1992 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 5).

Derivatio nominis. The name of this new species is derived from the striking colour of the male.

Diagnosis. A small species of the genus *Sphyrotheca* BÖRNER, 1906, with 6 diagnostic characteristics:

- Head pale or white, body laterally blue or completely black,
- thorax with 4+4 thick setae,
- posterior part of large abdomen also with thick setae,
- abdominal segment VI with length of setae A2 < A3,
- formula of anterior setae of dentes 1...1,
- mucro with short distal point.

Description. Measurements and proportions. Total length 0.6 mm in both sexes; head 0.25 mm in female, 0.2 mm in male; mucro 50 µm in both sexes; appendices anales 50 µm; inner edge of claw III 30 µm in both sexes; blunt setae of large abdomen up to 70 µm in female, 55 µm in male (the longest on dorsal part of large abdomen); knobbed setae of large abdomen 65 µm in female, 50-60 µm in male (the longest on dorsal part of large abdomen); small sensillum like setae of large abdomen 6-18 µm in female, 5-10 µm in male. Length of antennae:head diagonal = 1.8 in female, 2 in male; antennal segments I:II:III:IV = 1:1.6:2.2(2.4):5.1(6.4) in female (and male); dens:mucro = 3.7 in female, 3.2 in male; appendices anales:mucro = 1.0; appendices anales:claw III inner edge = 1.6; mucro:claw III inner edge = 1.5 in female, 1.8 in male.

Colour (Fig. 55). Eye-patches black; background colour of head and body white with blue to black pigment. Female with blue shade on lateral parts of head and large abdomen, dorsal side of large abdomen with a W-shaped dark pattern; antennae darker than legs and furca. Male with white head with lateral blue shade and dark frontal eye, large abdomen and segment V black, segment VI white; antennae dark blue, leg I almost white, leg II paler than III, furca blue with mucrones dark blue.

Chaetotaxy and special structures (applied to both sexes if not otherwise stated). Head and body (Figs. 56, 59) with strong, blunt and slightly rough setae besides other forms; head also with normal and minute ones; large abdomen also with thin, knobbed setae and with short sensillum-like ones; neosminthuroid setae present.

Head (Fig. 56). Eye-patches with 8+8 ommatidia, A and B larger than others, setae missing; dorsal parts of head with 10-12 rough spinelike setae (a1+a1?, a2+a2, b2+b2, 1+1 of apex, 2+2 of dorsal head-back), 4 very short setae (a3+a3, 2 median setae of apex, Fig. 57), and 1+1 short tube shaped setae (pair no. 3 of dorsal head-back, Fig. 57), 1+1 cuticular pores ventral of setae a1, pair b1 and frontal seta m thinner than adjacent clypeal setae, pair b2 on separated protuberances and near to each other; ventral parts of head with cross rows a-g as usual, rows a with lateral 2+2 setae hook-like, setae of other rows normal, region M with 9 setae in symmetric positions, 2+2 oval organs of ventral head-back.

Antennae (Fig. 58). Segment I with 5 distal setae, no. 1 missing, no. 2 minute or reduced to a cuticula pore; segment II with normal, 2 long and several minute setae and with 2 oval organs of posterior side; segment III with normal and 2-3 long setae, antennal organ with 2 short setae, posterior side basally with 1 oval organ; segment IV with 8-9 intermediate subsegments, with long dorsal setae and 5 dorso-anterior sensilla (including 2 large distal ones), 7 dorso-posterior sensilla (including 2 large basal and 1 large distal one), and 10 tip sensilla.

Large abdomen (Figs. 59-61). In female all setae longer than in male. Thick, blunt setae directed towards the posterior, thin, knobbed ones directed towards the anterior; in front of bothriotrichia AB with 4+4 thick setae and 1+1 short tubelike ones, several of the latter form inserted around bothriothrix C; furca base (Figs. 62, 63) with several short and several long normal setae and 1+1 neosminthuroid setae with a long basis. Ventral tube with warty sacks and 1+1 short and thin setae, retinaculum 4, ventral region 1+1 long setae.

Small abdomen. Segment V (Fig. 64) with 2+2 long setae, 1+1 short blunt and 1+1 minute ones; genital papilla in female with few, in male with many setae the ventral 2+2 of which longer and thicker than others. Segment VI (Figs. 64, 65) dorsal parts with blunt setae A2, A3 with length of A2 < A3, dorsal circumanal setae in female longer and thicker than in male; ventral parts with 2+2 long and strong lateral setae, also 2+2 circumanal setae av3, av4 long and strong; appendices anales (Fig. 65) long with tip broadened and ciliate.

Legs. Trochanter III with a thick posterior spine as usual. Tibiotarsi I-III (see Fig. 74) with most setae long and strong, 3 basal setae FP and only FSa present, rows p with 5, 4, 4 setae respectively, row a shifted distally, seta IVi varying from normal to short and thin, secondary setae 4ai, 4pi present (in tibiotarsus III also seta 3ai), each tibiotarsus with 4 oval organs 1pe, 2pe, 4pe, Vi. All claws of same shape (Fig. 66), with small tunica, small inner tooth and several lateral teeth; empodia broad (Fig. 66), filaments I and II bandlike with broadened tip, filament III thin and straight.

Furca (Fig. 67). Most setae normal. Manubrium with 7+7 setae, 2 of which short and thin; most setae of dentes short, outer row E with 3, inner row J with 2, postero-outer row PE with 1, posterior row P with 8 setae (P6 missing), formula of anterior setae 1...1; mucro (Fig. 67) with round inner teeth and short apical point.

Remarks. *Sphyrotheca caputalba* n.sp. can be easily differentiated from the other new species by its striking colour pattern, the whitish head and the bluish abdomen. The

general chaetotaxy of the head and abdomen of these new species is similar, but there are several special characteristics separating them as shown in the diagnoses.

For a comparison with the two other species known from the Neotropics see below.

Sphyrotheca coeruleocapitata n.sp.

Holotype. Male (on 3 slides, at INPA), Brazil, Amazonas, terra firme, Adolpho Ducke Forest Reserve near Manaus, canopy fogging of Cupiuba tree no. 59, sample C-59-26.VIII.1992 leg. ADIS et al. (number of coll. BRETFELD: ADIS I 3a). No further specimens known.

Derivatio nominis. The name of this new species is derived from the striking colour of the male.

Diagnosis. A small species of the genus *Sphyrotheca* BÖRNER, 1906, with 6 diagnostic characteristics:

- Head and legs dark blue, body white,
- thorax with 6+6 thick setae,
- posterior part of large abdomen without thick setae,
- abdominal segment VI with length of setae A2 = A3,
- formula of anterior setae of dentes 0...1,
- mucro with long distal point.

Description. Measurements and proportions. Total length 0.6 mm; head 0.22 mm; mucro 58 µm (including 6 µm of apical point); inner edge of claw III 30 µm; blunt setae of large abdomen up to 53 µm (the longest on lateral parts of thorax); knobbed setae of large abdomen up to 66 µm (the longest on postero-lateral parts). Length of antennae:head diagonal = 1.9; antennal segments I:II:III:IV = 1:1.6:2.0:5.1; dens:mucro = 3.2; mucro:claw III inner edge = 2.

Colour (Fig. 68). Eye-patches black; background colour of head and body white with dark blue pigment. Head blue with paler frons, anterior part of thorax blue, other parts of large and small abdomen white; extremities including ventral tube blue, mucrones darker than dentes.

Chaetotaxy and special structures. Head and body with strong, blunt and slightly rough setae besides other forms (Fig. 71, see also Fig. 56); head also with normal and minute ones; large abdomen also with thin, knobbed setae and with short sensillum-like ones; neosminthuroid setae present.

Head. Eye-patches (Fig. 69) with 8+8 ommatidia, B largest, others of equal shape, setae missing; dorsal parts of head (see Figs. 56, 57) with 10-12 rough spinelike setae (a1+a1?, a2+a2, b2+b2, 1+1 of apex, 2+2 of dorsal head-back), 2 very short median setae of apex, frontal pair a3 almost reduced or missing, and 1+1 short tube shaped setae (pair no. 3 of dorsal head-back), 1+1 cuticular pores ventral of setae a1, pair b1 and frontal seta m as thick as adjacent clypeal setae, pair b2 on separated protuberances and near to each other; ventral parts of head (see Fig. 56) with cross rows a-g as usual, rows a with lateral 2+2 setae hooklike, setae of other rows normal, region M with 9 setae in symmetric positions, 2+2 oval organs of ventral head-back.

Antennae. Segment I (Fig. 70) with 5 distal setae, no. 1 and 5 missing, no. 2 minute; segment II (see Fig. 58) with normal, 2 long and several minute setae and with 2 oval organs of posterior side; segment III (see Fig. 58) with normal and 2-3 long setae, antennal organ with 2 short setae, posterior side basally with 1 oval organ; segment IV (see Fig. 58) with 9 intermediate subsegments, with long dorsal setae, 5 dorso-anterior

sensilla (including 2 large distal ones) and 7 dorso-posterior sensilla (including 2 large basal and 1 large distal one).

Large abdomen (Fig. 71). Thick, blunt setae directed towards the posterior, thin, knobbed ones directed towards the anterior; in front of bothriotrichia AB with 6+6 thick setae, several short tubelike setae around bothriothrix C; posterior part of large abdomen with thin, knobbed but only a few thick setae; furca base with several short and several long normal and 1+1 neosminthuroid setae with a long basis (Fig. 72). Ventral tube with warty sacks and 1+1 short and thin setae, retinaculum 4, ventral region 1+1 long setae.

Small abdomen. Segment V (Fig. 73, see also Fig. 64) with 2+2 long setae, 1+1 short blunt, and 1+1 minute ones; genital papilla with many normal setae, the ventral ones longer but not thicker than others. Segment VI (see Fig. 64) dorsal parts with short blunt setae A2, A3 with length of A2 = A3, ventral parts with 2+2 lateral setae longer and stronger than others.

Legs. Trochanter III with a thick posterior spine as usual. Tibiotarsi I-III (Fig. 74) with most setae long and strong, 3 basal setae FP and only FSa present, rows p with 5, 4, 4 setae respectively, row a shifted distally, seta IVi varying from normal to short and thin, secondary setae 4ai, 4pi present (in tibiotarsus III also seta 3ai), each tibiotarsus with 3 oval organs 1pe, 2pe, Vi, oval organ 4pe not certain. All claws of same shape (see Fig. 66), with small tunica, small inner tooth and several lateral teeth; empodia broad (see Fig. 66), filaments I and II bandlike with broadened tip, filament III thin and straight.

Furca (Fig. 75). Manubrium not analysed. Most setae of dentes short and normal, 2 basal ones short and thin, outer row E with 5, inner row J with 3-4, postero-outer row PE with 1, posterior row P with 9 seate, formula of anterior setae 0...1; mucro with round inner teeth and long apical point.

Remarks. *Sphyrotheca coeruleocapitata* n.sp. can be easily differentiated from the other new species by its striking colour pattern, the bluish head and legs and the whitish abdomen. The general chaetotaxy of the head and abdomen of these new species is similar, but there are several special characteristics separating them as shown in the diagnoses.

Only two *Sphyrotheca* species have been described from the Neotropics, *Sphyrotheca vanderdrifti* DELAMARE-DEBOUTTEVILLE & MASSOUD, 1964, from Surinam, and *Sphyrotheca bellingeri* BETSCH, 1965, from Jamaica (*Sphyrotheca aleta* WRAY, 1953, from Costa Rica belongs to *Lipothrix*; see RICHARDS 1968). Both species differ from the new species in their colour, their pattern of head setae and in having more anterior setae on the dentes. The colour and the reduced number of dens setae also distinguish the new species from all other *Sphyrotheca* species known. The pattern of head setae may also be species-specific and should, therefore, always be analysed carefully (BRETFELD 2000).

Sturmius truncivivus BRETFELD & GAUER, 2000

Material. 1 female (on 2 slides, at INPA), sample C-59-23.II.1992 (Cupiuba tree no. 59) (number of coll. BRETFELD: ADIS I 2); 1 female (on 2 slides, in author's coll.), sample C-64-26.VIII.1992 (Cupiuba tree no. 64) (number of coll. BRETFELD: ADIS I 3b).

Whitish yellow with some pale blue spots and with 2+2 short spines dorsal to bothriotrichia AA as originally described. Total length 0.6 mm.

Acknowledgments

I thank Joachim Adis, Tropical Ecology Working Group, Max-Planck-Institute for Limnology at Plön/Germany, for the opportunity to describe the Symphypleona of his canopy study from Brazilian Amazonia, and it is with great pleasure that I dedicate one of the new genera to him. I acknowledge the valuable comments on my manuscript by Wolfram Dunger, Görlitz/Germany, Erhard Christian, Vienna/Austria, and Steve Hopkin, Reading/Great Britain, and also thank the latter for helping with my English.

References

ADIS, J., HARADA, A.Y., FONSECA, C.R.V. DA, PAARMANN, W. & J.A. RAFAEL (1998): Arthropods obtained from the Amazonian tree species "Cupiuba" (*Goupia glabra*) by repeated canopy fogging with natural pyrethrum. - Acta Amazonica **28**(3): 273-283.

BRETFELD, G. (1986): Phylogenetic systematics of the higher taxa of Symphypleona BÖRNER, 1901 (Insecta, Entognatha, Collembola). - In: DALLAI, R. (ed.): 2nd Intern. Seminar Apterygota, Siena: 307-311.

BRETFELD, G. (1990): Chaetotaxy of four species of the genera *Heterosminthurus, Bourletiella, Deuterosminthurus*, and *Prorastriopes* (Insecta, Collembola, Symphypleona). - Zool. Jb. Syst. **117**: 441 - 489.

BRETFELD, G. (1999): Symphypleona. - In: DUNGER, W. (ed.): Synopses on Palaearctic Collembola, Vol. 2. Abh. Ber. Naturkundemus. Görlitz **72**(1): 1-318.

BRETFELD, G. (2000): Third report on Symphypleona from Russia, and also from Georgia, Kazakhstan, Kirghizia, and the Ukraine (Insecta, Collembola). - Abh. Ber. Naturkundemus. Görlitz **72**(1): 1-57.

BRETFELD, G. & U. GAUER (1994): Diagnostic description of the males of new *Sphaeridia* species (Insecta, Collembola) from South America. - Andrias **13**: 113-136.

GUILBERT, E., BAYLAC, M. & J. NAYT (1995): Canopy arthropod diversity in a New Caledonian primary forest sampled by fogging. - Pan-Pacific Ent. **71**: 3-12.

HARADA, A.Y. & J. ADIS (1998): Ants obtained from trees of a "Jacareúba" (*Calophyllum brasiliense*) forest plantation in Central Amazonia by canopy fogging: first results. - Acta Amazonica **28**(3): 309-318.

NAYROLLES, P. (1988): Chétotaxie tibiotarsale des Collemboles Symphypléones. - Trav. Lab. Ecobiol. Arthr. Edaph., Toulouse **5**(4): 1-19.

PALACIOS-VARGAS, J.G., CASTAÑO-MENESES, G. & A. PESCADOR RUBIO (1999): Phenology of canopy arthropods of a tropical deciduous forest in western Mexico. - Pan-Pacific Ent. **75**: 200-211.

PALACIOS-VARGAS, J.G. & V. GONZALEZ (1995): Two new species of *Deuterosminthrus* (Bourletiellidae), epiphytic Collembola from the neotropical region with a key for the American species. - Florida Ent. **78**: 286-294.

RICHARDS, W.R. (1968): Generic classification, evolution, and biogeography of the Sminthuridae of the world (Collembola). - Mem. Ent. Soc. Canada, No. **53**: 1-54.

STORK, N.E., ADIS, J. & R.K. DIDHAM (eds.) (1996): Canopy Arthropods. - Chapman & Hall, London.

Table 1: Differences between *Arborianna* n.g. and related genera.

	Katianna	***Polykatianna***	***Arborianna* n.g.**
Head setae long	+	+	–
Head setae spinelike	+	–	+
Ant III with papilla	+	+	+
Ant IV subdivided	+	+	–
Neosminthuroid setae	–	–	+
Female seta aO forked	–	–	–
Female circumanal setae winged	–	–	–
Furca base with thick setae	8	?	7

Table 2: Comparison of head chaetotaxy of *Sminthurinus* species with that of *Arborianna cupiubae* n.g. n.sp. (see Figs. 26, 40, 41).

Setae of	***Sminthurinus aureus*-group**	***Sminthurinus niger*-group**	***Arborianna cupiubae* n.g. n.sp.**
Dorsal head-back	3+3	3+3	3+3
Eye-patches	2+2	2+2	2+2
Apex	2m2	3+3	2+2
Frons rows a	4+4	5+5	4+4
Frons rows b	4+4	6+6	4+4
Clypeus rows a	3+3(2m2)	4m4	4+4
Clypeus rows b	4+4	6+6	5+5
Clypeus rows c	5+5	7+7	5-6+5-6
Clypeus rows d	3+3(d1-)	4+4(d1-)	4+4(d1-)
Clypeus rows e	7m7	8(m)8	7m7
Clypeus rows f	9+9	10+10	9+9
Clypeus rows g	3+3	3+3	3+3
Clypeus region M	7-11	8-12	4-8

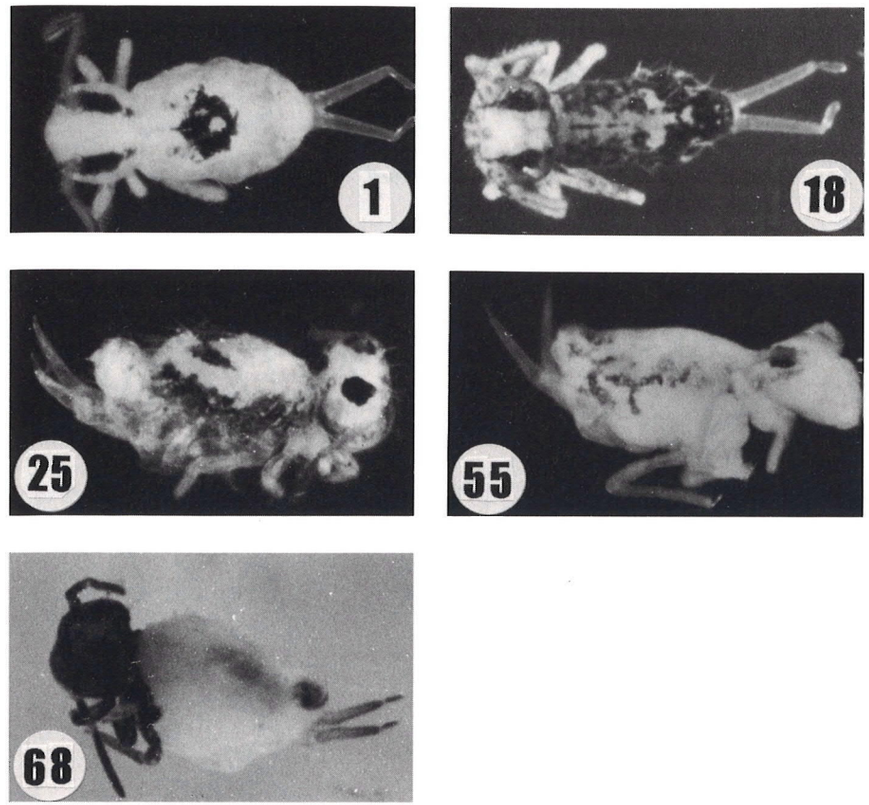
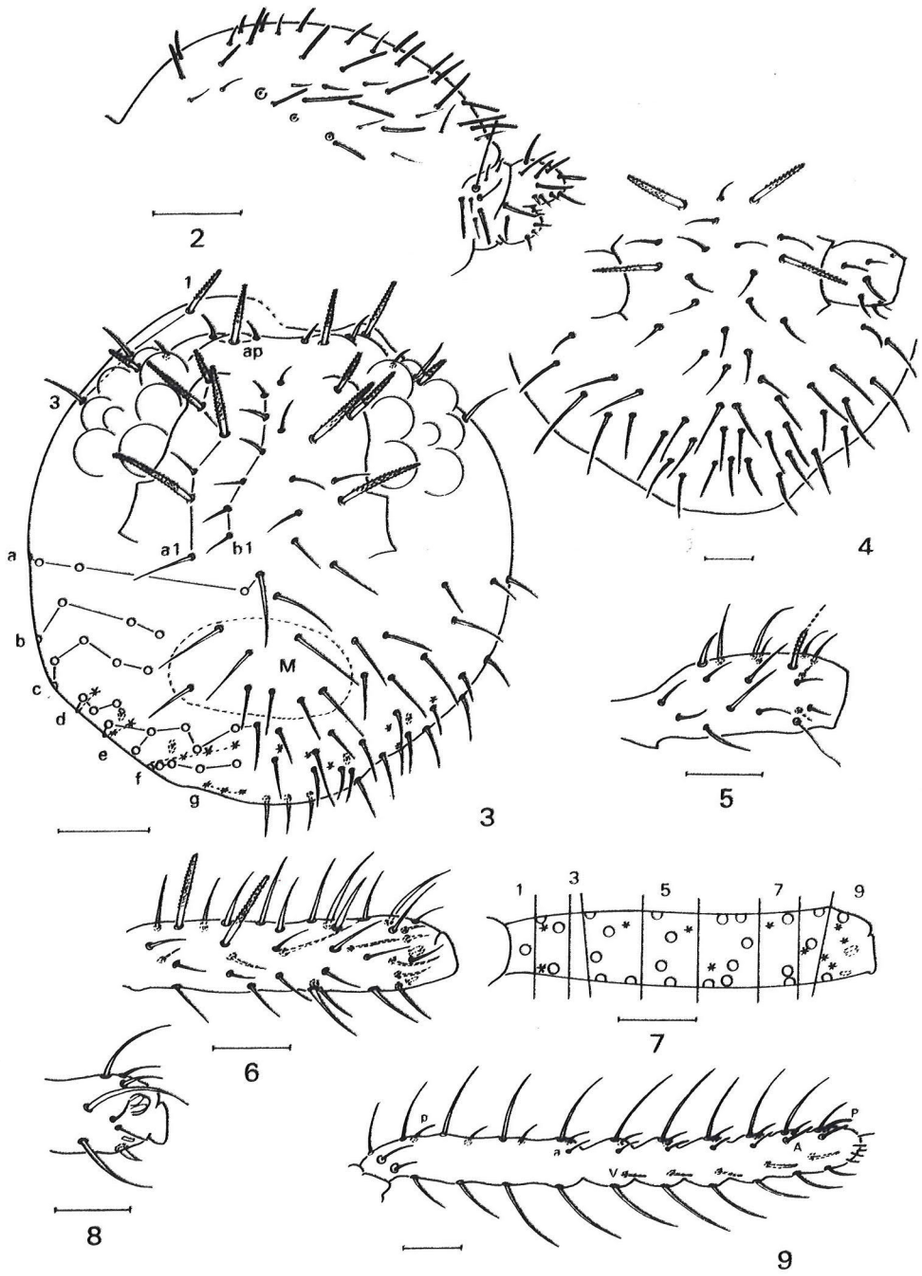
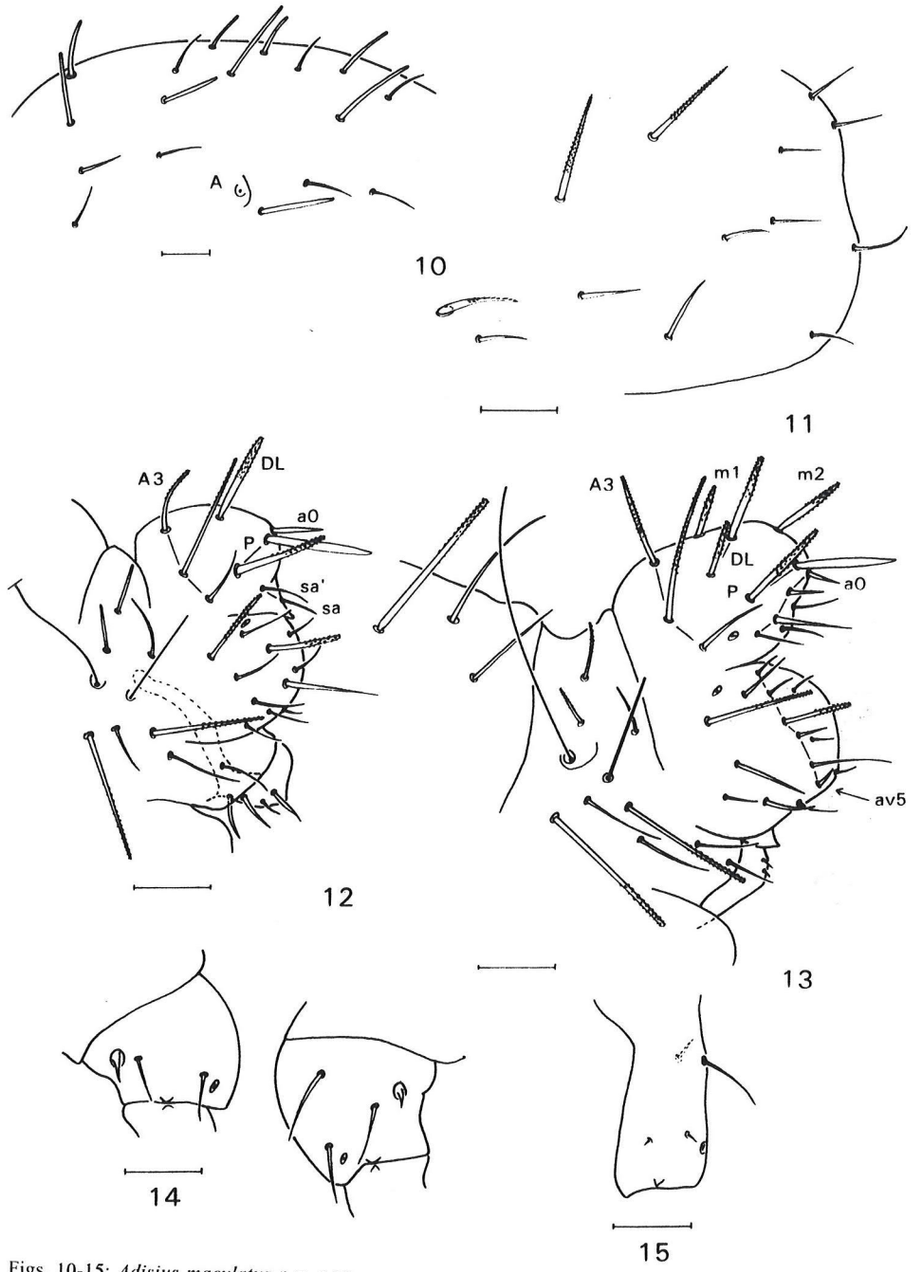


Fig. 1:
Adisius maculatus n.g. n.sp.; male colour pattern, length without furca 0.5 mm.



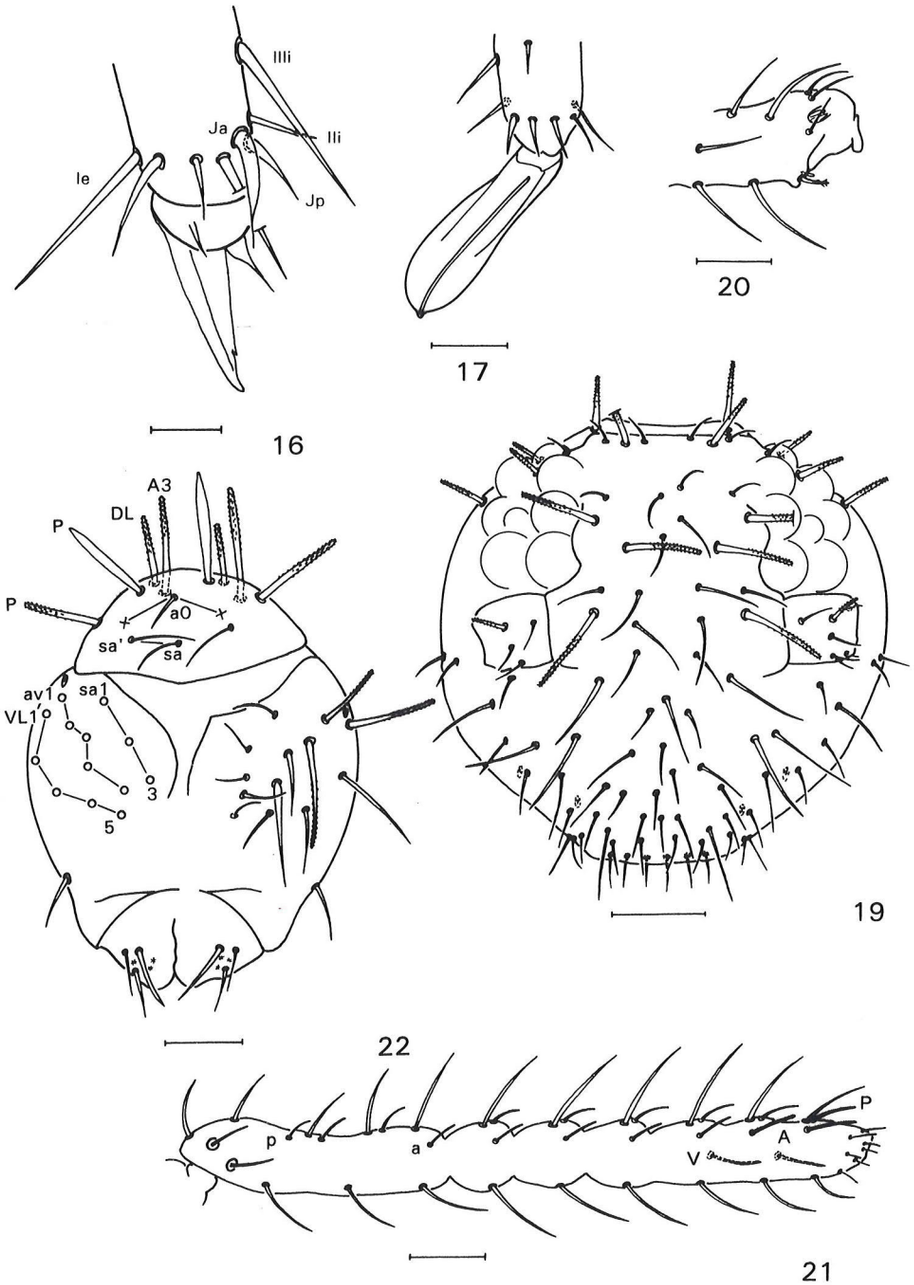
Figs. 2-9: *Adisius maculatus* n.g. n.sp.

2: Juvenile female habitus of abdomen. Scale: 100 µm. **3**: Juvenile female head setae and chaetotaxy. Scale: 50 µm. **4**: Male part of head setae. Scale: 25 µm. **5**: Juvenile female antennal segment II. Scale: 25 µm. **6**: Juvenile female antennal segment III. Scale: 25 µm. **7**: Male chaetotaxy of antennal segment III. Scale 25 µm. **8**: Male apex of antennal segment III. Scale: 25 µm. **9**: Male position of anterior, posterior and ventral sensilla of antennal segment IV. Scale: 25 µm.



Figs. 10-15: *Adisius maculatus* n.g. n.sp.

10: Juvenile female setae of dorso-anterior part of large abdomen. Scale: 25 µm. **11**: Juvenile female furca base of left side with neosminthuroid seta. Scale: 25 µm. **12**: Male small abdomen, not all ventral setae drawn. Scale: 25 µm. **13**: Juvenile female small abdomen, not all ventral setae drawn. Scale: 25 µm. **14**: Juvenile female coxa II and III. Scale: 25 µm. **15**: Juvenile female trochanter I. Scale 25 µm.

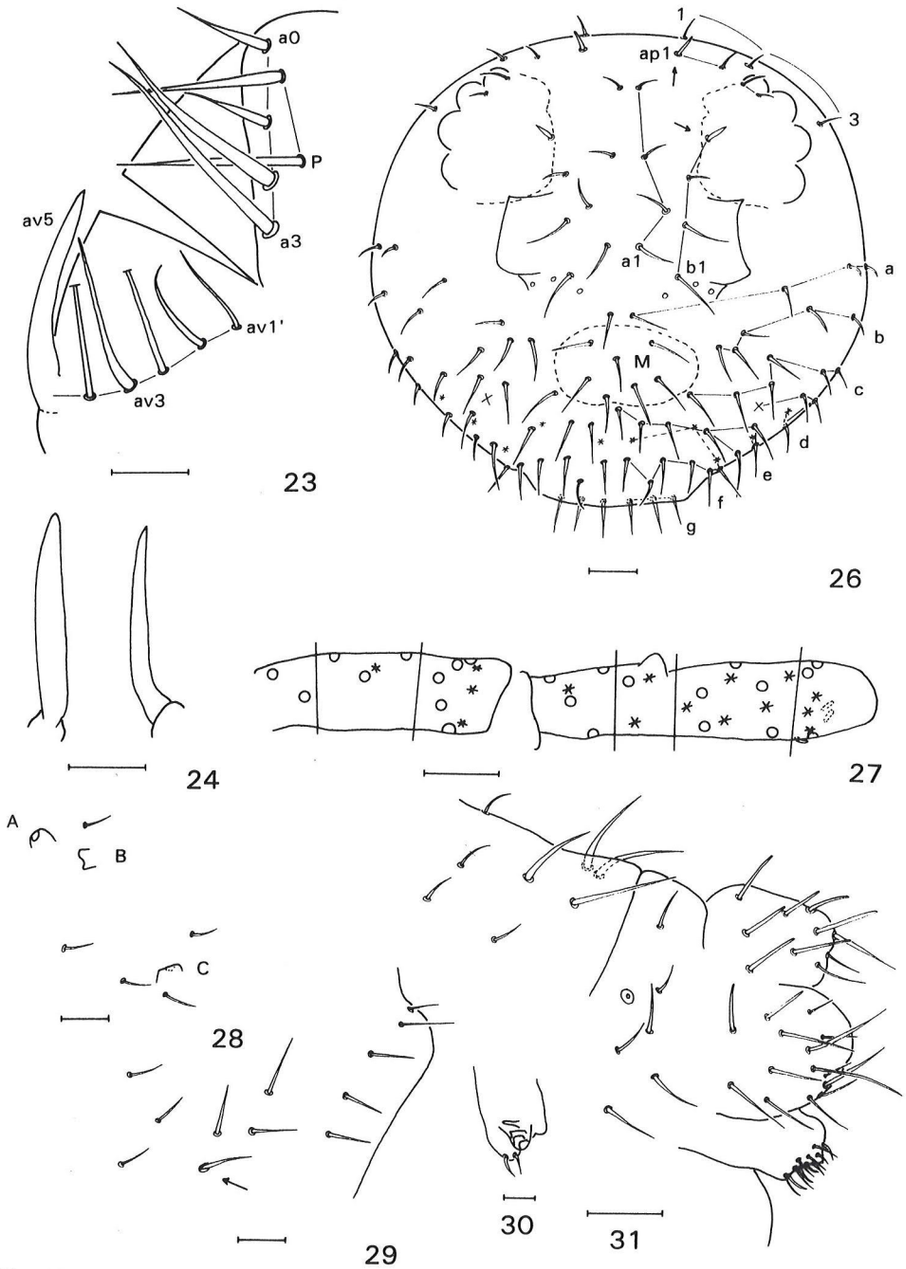


Figs. 16-17: *Adisius maculatus* n.g. n.sp.

16: Juvenile female tip of tibiotarsus I, claw and empodium. Scale: 10 µm. **17**: Juvenile female apex of dens and mucro. Scale: 50 µm.

Figs. 18-22: *Adisius fuscus* n.g. n.sp.

18: Male colour pattern, length without furca 0.55 mm. **19**: Male head setae, not all ventral setae drawn. Scale: 50 µm. **20**: Male apex of antennal segment III. Scale: 25 µm. **21**: Male position of anterior, posterior and ventral sensilla of antennal segment IV. Scale: 25 µm. **22**: Male small abdomen from posterior, some hidden genital setae marked by *. Scale: 25 µm.

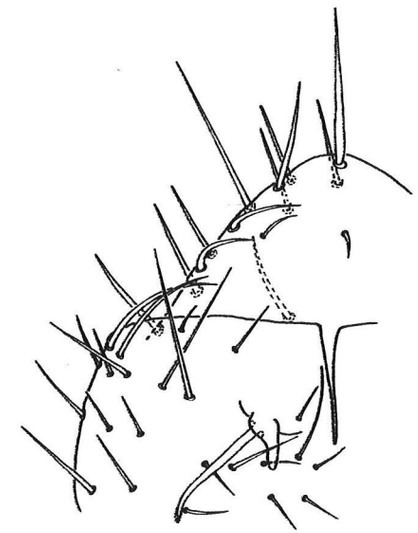


Figs. 23-24: *Adisius maassius*

23: Female circumanal setae. Scale: 25 µm. **24**: Female appendices anales frontal (left) and lateral view. Scale: 25 µm.

Figs. 25-31: *Arborianna cupiubae* n.g. n.sp.

25: Male colour pattern, length without furca 0.5 mm. **26**: Female head setae. Scale: 25 µm. **27**: Female chaetotaxy of antennal segment II and III. Scale: 25 µm. **28**: Female trichobothria ABC and adjacent setae. Scale: 25 µm. **29**: Female left furca base with neosminthuroid seta (arrow). Scale: 25 µm. **30**: Male retinaculum. Scale: 10 µm. **31**: Male setae of posterior part of large and small abdomen. Scale: 25 µm.



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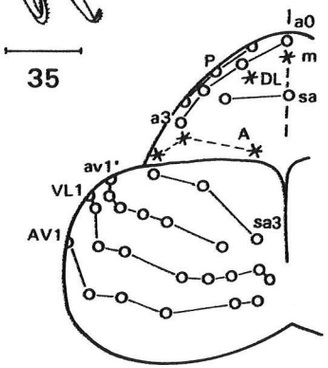

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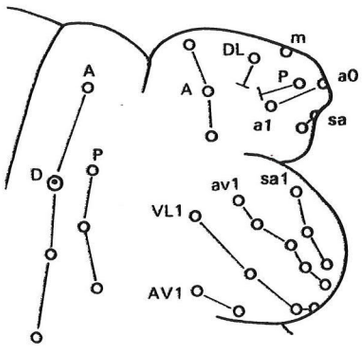

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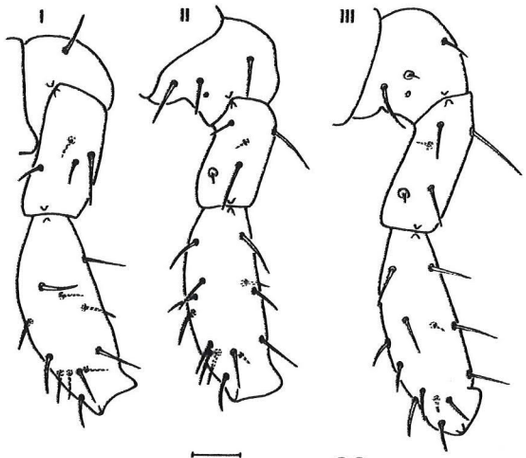

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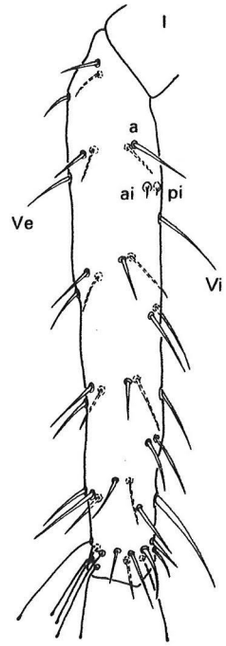
Figs. 32-36: *Arborianna cupiubae* n.g. n.sp.
32: Male chaetotaxy of small abdomen. Scale: 25 µm. **33**: Female setae of abdominal segment VI from posterior. Scale: 25 µm. **34**: Female chaetotaxy of abdominal segment VI. Scale: 25 µm. **35**: Female appendix analis of right side and detail (enlarged). Scale: 25 µm. **36**: Female basal segments of legs I-III. Scale: 25 µm.



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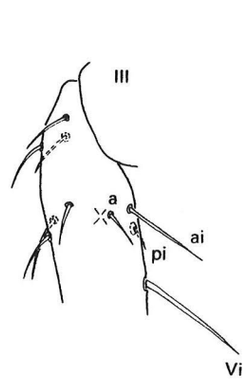

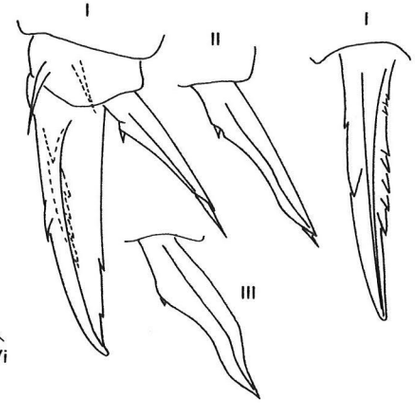

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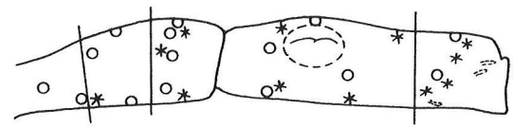

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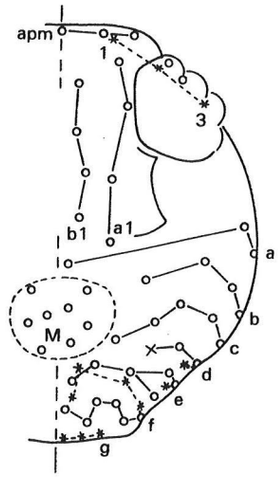

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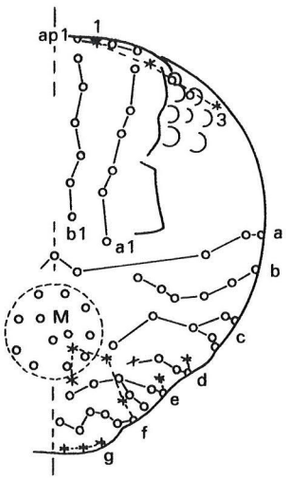

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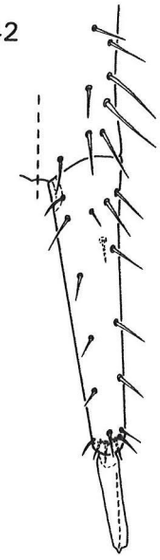

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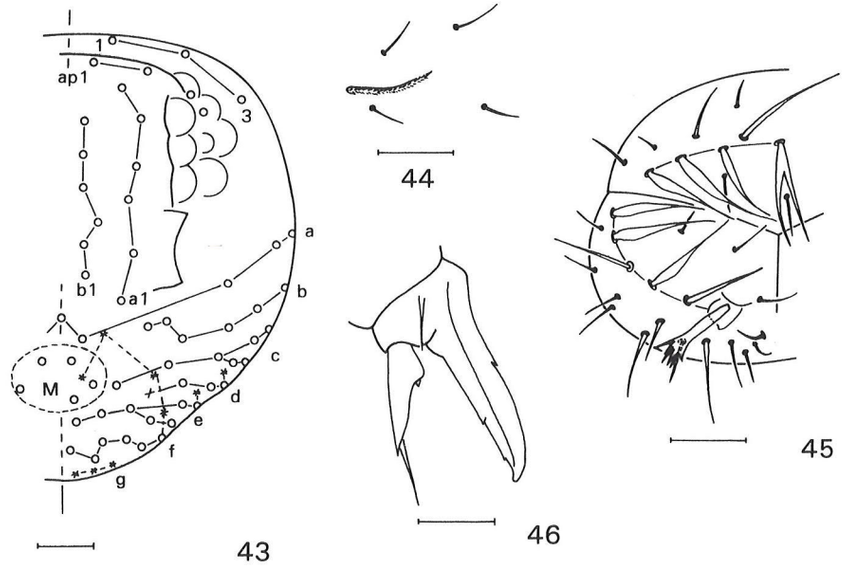
Figs. 37-39: *Arborianna cupiubae* n.g. n.sp.
37: Female tibiotarsus I and III. Scale: 25 µm. **38**: Female claw I from anterior and outer side, empodia I-III from anterior. Scale: 10 µm. **39**: Female furca right side from posterior. Scale: 25 µm.
Fig. 40: *Sminthurinus elegans*; female chaetotaxy of head. Scale: 25 µm.
Fig. 41: *Sminthurinus alpinus*; female chaetotaxy of head. Scale: 25 µm.
Fig. 42: *Sminthurinus aureus*; female chaetotaxy of antennal segment II and III. Scale: 25 µm.



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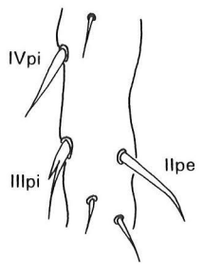

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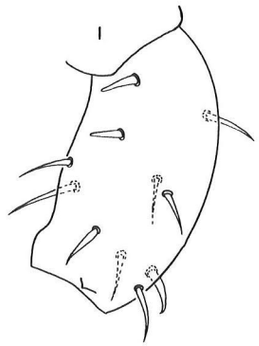

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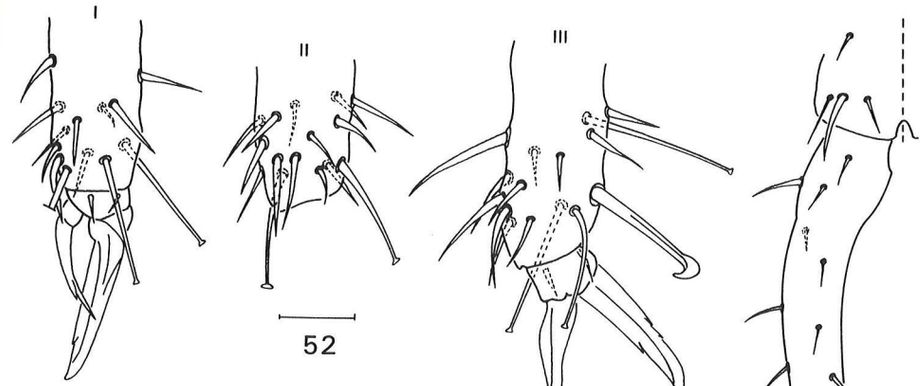
Figs. 43-47: *Sminthurinus aureussetosus* n.sp.

43: Female chaetotaxy of head. Scale: 25 µm. **44**: Female neosminthuroid seta. Scale: 25 µm. **45**: Female circumanal setae and appendix analis. Scale: 25 µm. **46**: Female claw and empodium I from anterior. Scale: 10 µm. **47**: Female dens and mucro from outer side. Scale: 25 µm.

Figs. 48-49: *Sphaeridia bivirgata* n.sp.

48: Male ventral tube obliquely from posterior. Scale: 10 µm. **49**: Male modified setae of tibiotarsus III. Scale: 10 µm.

Fig. 50: *Sphaeridia duckei* n.sp.; female right femur I from anterior. Scale: 10 µm.



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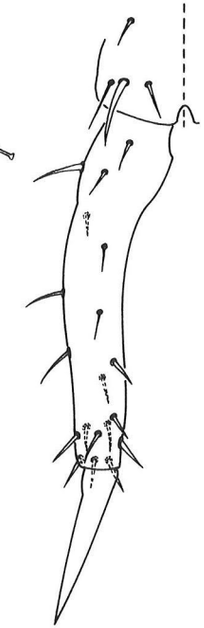

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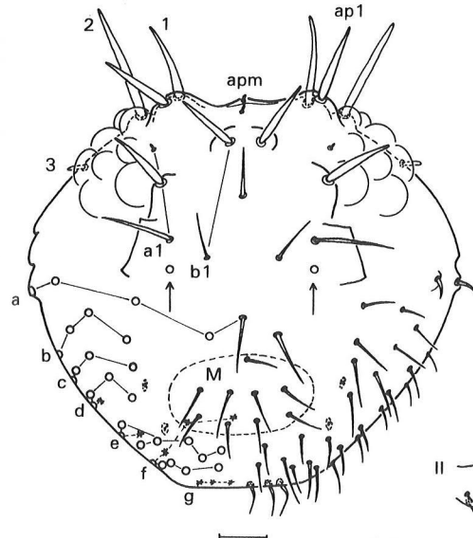

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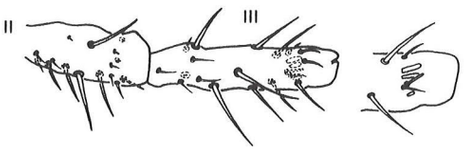

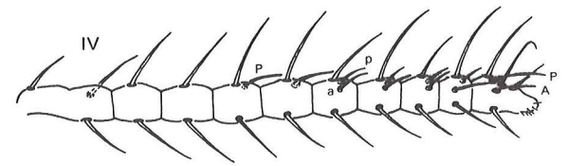

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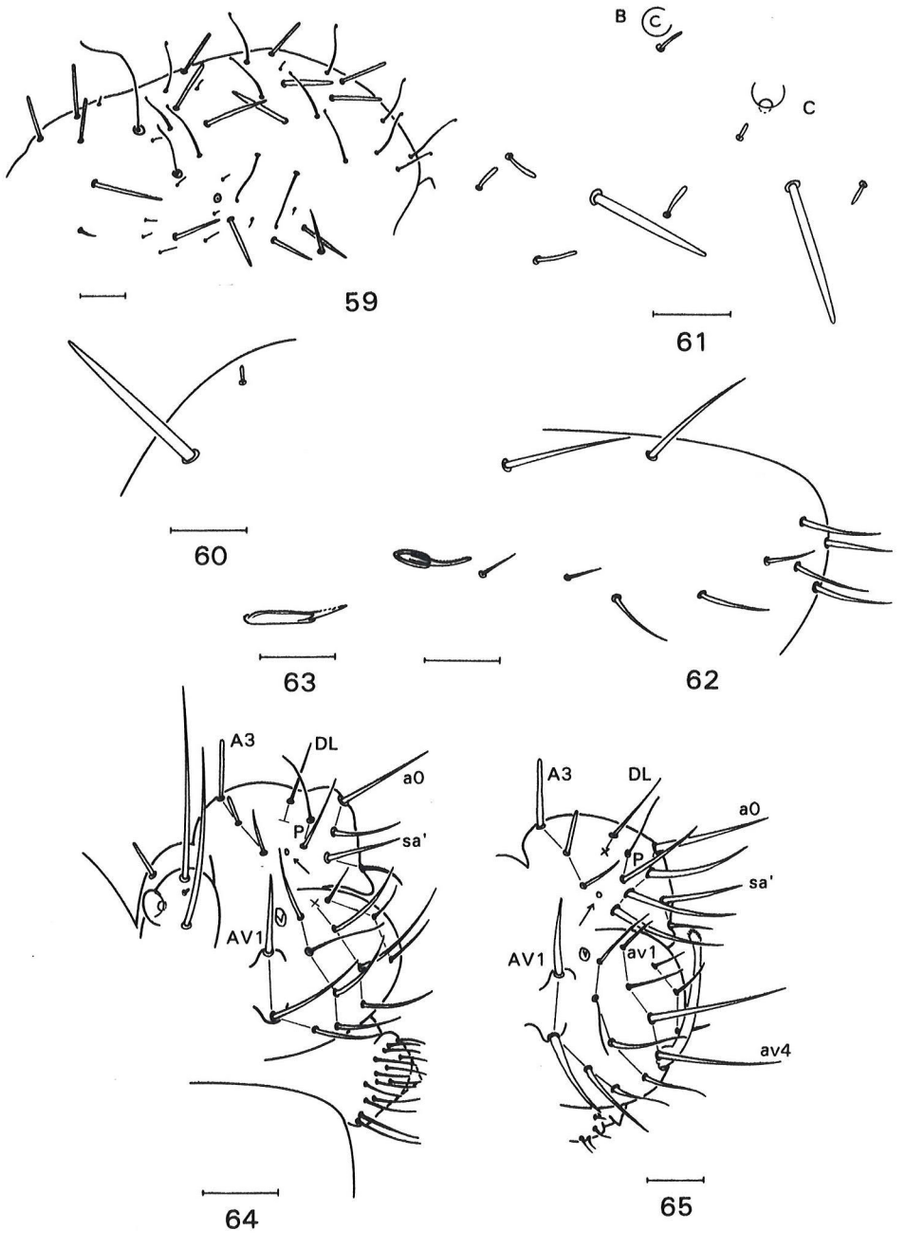
Figs. 51-54: *Sphaeridia duckei* n.sp.

51: Female tip, claw and empodium of tibiotarsus I from anterior. Scale: 10 µm. **52**: Female tip of tibiotarsus II from inner side, anterior side to the right. Scale: 10 µm. **53**: Female tip, claw and empodium of tibiotarsus III from anterior. Scale: 10 µm. **54**: Female furca left side from posterior. Scale: 10 µm.

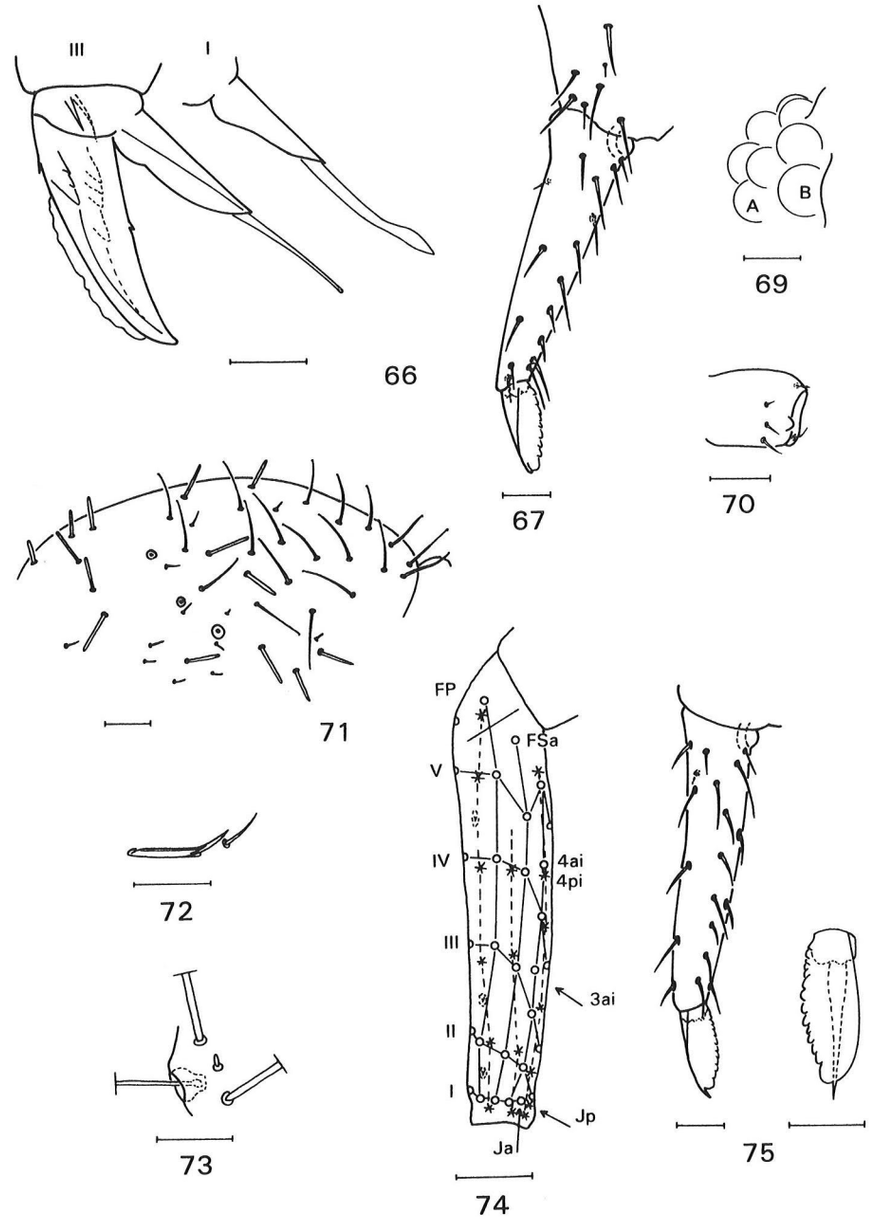
Figs. 55-58: *Sphyrotheca caputalba* n.sp.

55: Female colour pattern, length without furca 0.6 mm. **56**: Male chaetotaxy of head, not all ventral setae drawn, pores marked by arrows. Scale: 25 µm. **57**: Male setae apm, a3 and no. 3 of dorsal head-back enlarged. Scale: 10 µm. **58**: Male antennal segments I-IV from anterior, antennal organ III from posterior (enlarged), segment IV with anterior and posterior sensilla. Scale: 25 µm.



Figs. 59-65: *Sphyrotheca caputalba* n.sp.

59: Female setae of left side of large abdomen with bothriotrichia ABC. Scale: 50 µm. **60**: Male large and minute seta of thorax. Scale: 25 µm. **61**: Male setae near trichobothria BC. Scale: 25 µm. **62**: Male left furca base with neosminthuroid seta. Scale: 25 µm. **63**: Female neosminthuroid seta. Scale: 25 µm. **64**: Male abdominal segments V and VI, not all ventral setae drawn, pore marked by arrow. Scale: 25 µm. **65**: Female abdominal segment VI, not all ventral setae drawn, pore marked by arrow. Scale: 25 µm.



Figs. 66-67: *Sphyrotheca caputalba* n.sp.

66: Male claw and empodium III and empodium I, both from anterior. Scale: 10 µm. **67**: Male furca left side from posterior. Scale: 25 µm.

Figs. 68-75: *Sphyrotheca coeruleocapitata* n.sp.

68: Male colour pattern, length without furca 0.6 mm. **69**: Male right eye-patch from anterior. Scale: 25 µm. **70**: Male antennal segment I. Scale: 25 µm. **71**: Male setae of left side of large abdomen with trichobothria ABC. Scale: 50 µm. **72**: Male neosminthuroid seta. Scale: 25 µm. **73**: Male setae near trichobothrium D. Scale: 25 µm. **74**: Male chaetotaxy of tibiotarsus III. Scale: 25 µm. **75**: Male setae of dens and mucro of left side from posterior and mucro of right side enlarged. Scales: 25 µm.