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Collembola Symphypleona (Insecta) from the Republic of Yemen

GERHARD BRETTFELD

Zoological Institute, University of Kiel

Abstract

From 18 samples of Collembola-Symphypleona of the Republic of Yemen, 3 new genera, 9 new species, and only 1 already known species are described. The mountainous landscape and the arid climate both apparently favour the speciation of the Symphypleona.

Zusammenfassung

Collembola Symphypleona (Insecta) aus der Republik Yemen.

In 18 Proben von Collembola-Symphypleona aus der Republik Yemen wurden 3 neue Gattungen, 9 neue Arten und nur 1 bekannte Art gefunden. Die Gebirge des Landes zusammen mit dem ariden Klima begünstigen offenbar die Speziation der Symphypleona.

Introduction

As has often been mentioned before, our knowledge of animal species in general and, of course, also of the Collembola Symphypleona is over and over again surprisingly widened by collections from non-European countries. Thus, the Symphypleona from Yemen studied here, which were collected by A. van Harten, are a valuable and unique opportunity to widen our knowledge of Symphypleona to the southern Arabian Peninsula. These samples contain 3 new genera and, except one, only new species. The genera resemble those known from the Mediterranean, from Africa, and from Madagascar, but demonstrate that in this region there is a separate fauna of Symphypleona, the differentiation of which is obviously favoured by the arid climate and the mountainous landscape of Yemen. These facts both isolate the populations and thus increase the speciation, as was similarly observed in Northwest Africa, in Morocco (BRETTFELD 2001). On the other hand, the relatively small number of specimens and the lack of collections from the surrounding countries do not allow us the discussion of the findings under a wider geographical point of view or to demonstrate habitat differences within the country.

The samples were collected by pitfall, malaise, or light traps, and also by beating the vegetation into a dish; a sweepnet was not used as there were many thornbushes.

The preparation method and the nomenclature of the chaetotaxy follow the author's previous papers. The types and all other specimens are held in the author's collection. The account of the taxa is given in alphabetical order.

List of the samples

1. No. 126: Sana'a, Department of Plant Protection, agricultural testing farm in the town centre at about 2300 m altitude, II/1991 leg. van Harten.
2. No. 490: Same, but IX/1991 leg. van Harten.
3. No. 53: Ta'izz, Agricultural Research and Extension Authority, agricultural testing farm on the outskirts of the town at about 1500 m altitude, 19./20. X. 1991 leg. van Harten.
4. No. 795: Al Hajjarah, near a mountain slope at about 2200 m altitude, 14. III. 1992 leg. van Harten.
5. No. 843: Al Mahwit-Khamis Bani Sa'd, slope of dry Wadi Dayan at about 1500 m altitude, 17. III. 1992 leg. van Harten.
6. No. 905: Ibb-Ta'izz, road border at Sayyani pass at about 2200 m altitude, 22./24. III. 1992 leg. van Harten.
7. No. 1026: Wadi Hadramaut, desert with oases at about 1000 m altitude, 25./27. IV. 1992 leg. van Harten.
8. No. 1689: Shuqrah-Lawdar, near a street between volcanic mountains at about 400 m altitude, 21. III. 1993 leg. van Harten.
9. No. 3032: Sana'a, area of the International School on the outskirts of the town, pitfall-traps near a dry mountain slope at about 2300 m altitude, III – IV/1998 leg. van Harten.
10. No. 3117: Ta'izz, Agricultural Research and Extension Authority, agricultural testing farm on the outskirts of the town at about 1500 m altitude, light-trap, 26./28. V. 1998 leg. van Harten.
11. No. 3165: Sana'a, area of the International School on the outskirts of the town, pitfall-traps near a dry mountain slope at about 2300 m altitude, V/1998 leg. van Harten.
12. No. 3209: same, but VI/1998 leg. van Harten.
13. No. 3245: Lahj, area of the Agricultural Faculty of the University of Aden at about 100 m altitude, malaise-trap, VI – VII/1998 leg. van Harten and A. Sallam.
14. No. 3321: Same, but VIII/1998 leg. van Harten and A. Sallam.
15. No. 3586: Same, but X/1998 leg. van Harten and A. Sallam.
16. No. 3648: Sana'a, Department of Plant Protection, agricultural testing farm in the town centre at about 2300 m altitude, light-trap, III – IV/1999 leg. van Harten.
17. No. S 75: Isle of Soqotra, near Hadibu, dry areas near the seashore at about 20 m altitude, 13./14. IV. 1993 leg. van Harten.
18. No. S 106: Isle of Soqotra, Wadi Daneghan, near a small river at about 300 m altitude, 4. X. 1998 leg. van Harten.

***Acutoempodialis* n. g.**

Type species: *Acutoempodialis lineatus* n. sp.

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

Mouthparts normal. Antennae shorter than body, segment IV without postero-basal sensilliform setae PB (see Fig. 10), with distal dorso-posterior sensillum P on 1st whorl behind tip, tip with 11 distal sensilla. Each tibiotarsus with smooth setae and several obliquely truncated or distally flattened inner setae. Tibiotarsus I – III with 3, 3, 2 spatulate setae respectively and 2 oval organs each, tibiotarsus I seta Ja appressed. Empodia without lamellae but with long inner needle, each filament thin and pointed, long but not exceeding claws. Dens with middle anterior setae longer than spaces between their bases. Male without sexually modified setae; some circumanal setae of female thicker than others and slightly waved.

Derivatio nominis. The name of this new genus is derived from the pointed empodial filaments. The gender is masculine.

Justification. *Acutoempodialis* n. g. appears in the key in BRETFFELD (1999) near the genus *Bourletides* Betsch, 1974, from Madagascar, the empodia of which also have filaments not exceeding the claws. The new differs from this genus since its empodia differ and its male has no secondary sexual characteristics.

This new genus also resembles *Fasciosminthurus* since both share the following characteristics: Antennal segment IV without postero-basal sensilliform setae PB, tibiotarsi with distally flattened setae, both sexes without secondary sexual characteristics, large abdomen row 5 with 2 setae, antennal segment IV with 11 tip sensilla and large dorso-posterior sensillum P in 1st whorl behind tip. The differences, however, are: Tibiotarsi with 2 oval organs each (instead of 1 each in *Fasciosminthurus*), empodial filaments thin, short, and straight (instead of thick, S-shaped, and exceeding claws), and tibiotarsus seta Ja appressed (instead of not appressed).

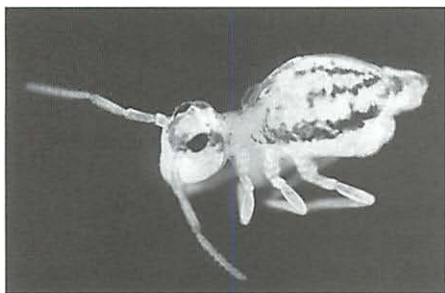
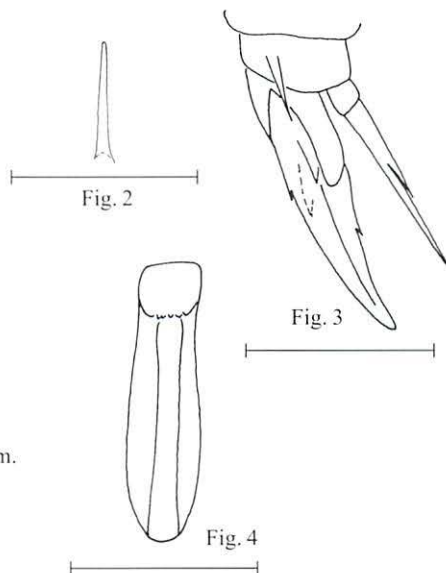


Fig. 1



Acutoempodialis lineatus n. g. n. sp.

- Fig. 1 Habitus and colour pattern.
Total length of head and body about 0.8 mm.
- Fig. 2 Appendices anales (bar = 50 μ m)
- Fig. 3 Claw and empodium II (bar = 20 μ m)
- Fig. 4 Mucro (bar = 50 μ m)

The combination of characteristics of *Acutoempodialis* has not yet been described in the Bourletiellida.

Based on the shape of the empodia, *Fasciosminthurus coronatus* (Betsch, 1977) from Mongolia, and *Fasciosminthurus saportae* Nayrolles, 1997, from France and Spain, may also belong to this new genus.

***Acutoempodialis lineatus* n. sp.**

Holotype. Female (on 3 slides) from sample 3648: Yemen, Sana'a, Department of Plant Protection, agricultural testing farm in town centre at about 2300 m altitude, light trap, III – IV/1999 leg. van Harten.

Paratypes. 4 males (in alc. and on slides) together with the holotype.

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

Diagnosis. A light species of the genus *Acutoempodialis* Bretfeld, see above, with 3 diagnostic characteristics:

- Head and abdomen yellow with dark horizontal bands,
- dens with 3 distal and 2 proximal inner setae,
- formula of anterior setae of dens 4,2,1,1...1.

Other diagnostic characteristics as mentioned for the genus.

Description. The description and the nomenclature of the chaetotaxy refer to that of *Fasciosminthurus virgulatus* (Skorikov, 1899) (see BRETFELD 1990, 1992).

Measurements and proportions (from 1 female and 1 male). Total female 0.7 mm, male 0.9 mm; head in female 0.27 mm, in male 0.3 mm; mucro in female 57 μ m, in male 76 μ m; inner edge of claw III in both sexes 26 μ m; appendices anales 32 μ m. Length of antennae : head diagonal = 1.8 in female, 2 in male; antennal segments I : II : III : IV = 1 : 2.2 : 2.7 : 5.9 in female, 1 : 2.3 : 3.1 : 6.1 in male; subsegmented part of antennal segment IV : basal part = 2 in both sexes; manubrium : dens : mucro = 4 : 3.4 : 1 in female, 3.6 : 3 : 1 in male; appendices anales : mucro = 0.56; mucro : claw III inner edge = 2.3 in female, 2.8 in male; appendices anales : claw III inner edge = 1.3.

Colour (Fig. 1). Eye patches black; background colour of head and body yellow with brown and black pigment. Head with light brown band between antennae and black stripes behind eye patches; large abdomen with 1+1 black lateral bands connected by anterior and posterior cross bands and with 1+1 black dorso-lateral bands or only 2 dorso-posterior bands in V-pattern; abdominal segment V with broad black spot, segment VI with black median line or apical spot; antennae light brown, legs and furca unpigmented.

Chaetotaxy and special structures (applied to both sexes if not otherwise stated). Head and anterior part of large abdomen with short and thin setae, posterior part of large abdomen and small abdomen with longer thin setae; male without sexually modified setae.

Head. Eye patches with 8+8 ommatidia, C and D smaller than others, 2+2 setae, cuticula between ommatidia coarser than on other parts of head; head apex with 5 (2-m-2) setae, frons rows a each 6, middle part 13 and 14 setae; clypeus rows a – g with usual set of setae but setal pair d1 missing, region M with 10 and 12 setae; ventral head-back with 1 or 2 oval organs; mouthparts normal.

Antennae. Total length shorter than body. Segment I as usual; segment II whorls 1–4 with 2, 4, 3, 9 setae respectively; chaetotaxy of segment III not distinct; segment IV with usual sensilla of whorl p1 but without postero-basal sensilliform setae PB (see Fig. 10), intermediate region T with 7–9 setae, distal part with 5 short subsegments, 4 antero-dorsal sensilla, 4 postero-dorsal sensilla (large sensillum P in whorl 6, i. e. behind tip, see Fig. 5), 2 ventral sensilla in whorls 2–5, and tip with 11 distal sensilla.

Large abdomen. Row 5 with 2 setae, i. e. ventral seta present; formula of flank-setae 5/-.

Small abdomen. Genital papilla in female with 13, in male about 14 setae. In both sexes, segment VI with 2 median setae and with A : 3, DL : 2, P : 2, 5 dorsal circumanal setae (a0, a1, a2) and 5 pairs of ventral ones (av1–5, av1' missing), dorsal and ventral anal valves with 1 pair of oval organs each; in female, circumanal setae except av4, thicker than others and wavy; appendices anales (= av5) (Fig. 2) long, thin, and tapering but tip blunt, slightly bowed to the dorsal.

Legs. Chaetotaxy of coxa and trochanter as usual. Femora in female lack several setae; in male, only femur III seta m4 missing; femur III seta d7 missing in both sexes. Tibiotarsi I–III rows p with 5, 5, 3 setae and distal part with 3, 3, 2 thin spatulate setae respectively, inner sides with some obliquely truncated or distally flattened setae, tibiotarsus I seta Ja appressed, each tibiotarsus without seta Ia but with seta Iii and with 2 oval organs in position 2pe, 3pe. All claws and empodia of same shapes (Fig. 3); claws slender with minute outer and inner tooth and 1 pair of larger lateral teeth; empodia without lamellae but with long inner needle, each filament thin and pointed, not exceeding claws.

Furca. All setae normal. In female, manubrium with 7+7 setae (setae 3 missing); dens rows E with 7 setae, J with 3 distal and 1–2 proximal setae, PE with 1, P with 7 setae, formula of anterior setae 4,2,1(1)...1, the 2,1,1 middle setae longer than spaces between their bases. In male, manubrium with 8+8 setae; dens rows E with 7/8 setae, J with 2/3 distal and 2 proximal setae, formula of anterior setae 4,2,1,1...1, others as in female. Mucro (Fig. 4) in both sexes smooth with anterior furrow of moderate width, seta missing.

Anarmatus n. g.

Type species: *Anarmatus taizzus* n. sp.

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

Mouthparts normal. Antennae shorter than body, segment IV without postero-basal sensilliform setae PB (see Fig. 10), with distal dorso-posterior sensillum P on 1st whorl behind tip, tip with 12 distal sensilla. Each tibiotarsus with smooth setae and several obliquely truncated or distally flattened inner setae. Tibiotarsus I–III with 3, 3, 2 spatulate setae respectively and 2 oval organs each, tibiotarsus I seta Ja not appressed. Empodia without lamellae, tapering directly into a thin filament, without or with only minute basal point, filaments knobbed and slightly exceeding claws. Dens with middle anterior setae longer than spaces between their bases. Male without sexually modified setae; female with the dorsal pair of circumanal setae furcate, the 2 following ones thick and toothed.

Derivatio nominis. The name of this new genus means 'without arms, unarmed' as the male lacks sexually modified setae in contrast to related genera. The gender is masculine.

Justification. *Anarmatus* n. g. appears in the key in BRETFFELD (1999) near the genera *Bovicornia* Delamare Deboutteville, 1947, from Senegal and *Massoudia* Betsch, 1975, from Madagascar, the females of which also have furcate circumanal setae. *Anarmatus* differs from those genera since its male has no sexually modified setae.

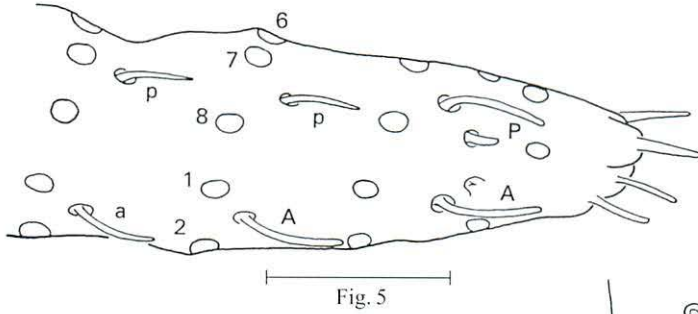


Fig. 5

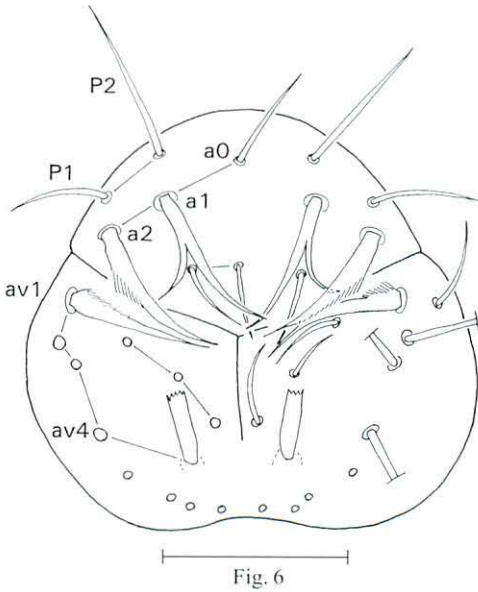


Fig. 6

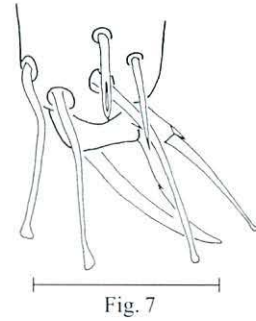


Fig. 7

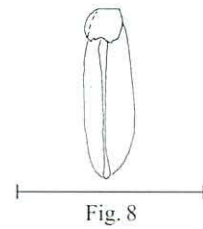


Fig. 8

Anarmatus taizzus n. g. n. sp.

Fig. 5 Tip of antenna with dorsal and some tip sensilla and dorsal setal rows (see text), (bar = 20 μ m)

Fig. 6 Female small abdomen (bar = 50 μ m)

Fig. 7 Tip of tibiotarsus II, claw, and empodium (bar = 20 μ m)

Fig. 8 Mucro (bar = 50 μ m)

The empodia of the new genus resemble those of the genus *Cyprania* Bretfeld, 1992, from Cyprus, as in this genus the basal empodial point may also appear short or minute. *Anarmatus* n. g. differs from *Cyprania* by the position of antennal segment IV sensillum P on 1st whorl behind the tip (instead of 3rd whorl in *Cyprania*), in the 2 oval organs of each tibiotarsus (instead of 1 – 2 in *Cyprania*), and in the furcate circumanal setae of the female (missing in *Cyprania*).

The male of the genus *Madecassiella* Betsch & Waller, 1996, from Madagascar, also lacks sexually modified setae but in this genus the tibiotarsi also lack the obliquely truncated or distally flattened setae.

The combination of characteristics of *Anarmatus* has not yet been described in the Bourletiellida.

Anarmatus taizzus n. sp.

Holotype. Female (on 3 slides) from sample 531: Yemen, Ta'izz, Agricultural Research and Extension Authority, agricultural testing farm on the outskirts of the town at about 1500 m altitude, 19./20. X. 1991 leg. van Harten.

Paratypes. 8 females (in alc.) together with the holotype. – 3 females and 1 male (on slides) from sample 3117, same locality as holotype but 26./28. V. 1998, light trap, leg. van Harten. – 1 female and 3 males (in alc. and on slides) from sample 126, Yemen, Sana'a, Department of Plant Protection, agricultural testing farm in town centre at about 2300 m altitude, II/1991 leg. van Harten.

Derivatio nominis. The name of this new species is derived from the type locality, the town Ta'izz in Yemen.

Diagnosis. A small, light species of the genus *Anarmatus* Bretfeld, see above, with 5 diagnostic characteristics:

- Rusty red to black pigment on head and large abdomen,
- whorl 4 of antennal segment III without setae,
- tibiotarsus I seta Ja not appressed,
- dens with 4 distal and 1 – 2 proximal inner setae,
- formula of anterior setae of dens 4,2,1...1.

Other diagnostic characteristics as mentioned for the genus.

Description. The description and the nomenclature of the chaetotaxy refer to that of *Fasciosminthurus virgulatus* (Skorikov, 1899) (see BRETfeld 1990, 1992) and *Cyprania gisae* Bretfeld, 1992 (see also BRETfeld 1996).

Measurements and proportions. Total female up to 0.8 mm, male 0.5 mm; head in female 0.25 mm, in male 0.2 mm; mucro in female 50 μ m, in male 45 μ m; inner edge of claw III in both sexes 16 μ m; appendices anales 18 μ m. Length of antennae : head diagonal = 1.6 in female, 1.7 in male; antennal segments I : II : III : IV = 1 : 1.7 : 2 : 4.5 in female, 1 : 1.9 : 2.4 : 5.4 in male; subsegmented part of antennal segment IV : basal part = 3 in female, 2.7 in male; manubrium : dens : mucro = 4 (3.5) : 3 : 1 in female (and male); appendices anales : mucro = 0.36; mucro : claw III inner edge = 3.4 in female, 2.8 in male; appendices anales : claw III inner edge = 1.2 (1.1 – 1.3).

Colour. Eye patches black; background colour of head and body yellow with dark yellow, rusty red, or brown to blackish pigment, in male more intense than in female, posterior pattern of abdomen often more intense than on other parts. Head with pigmented spots on inner sides of antennal bases, pigment may occur on clypeus, behind eye patches, and on dorsal head-back; dorsal and lateral parts of large abdomen in male intensely pigmented, in female only horizontal bands present; dorsal side of small abdomen more or less pigmented, segment V also with 1+1 large pale 'eyes', segment VI with 1+1 small pale 'eyes'; ventral side of body with little or without pigment; antennae blue, legs and furca unpigmented.

Chaetotaxy and special structures (applied to both sexes if not otherwise stated). Head and anterior part of large abdomen with short and thin setae, posterior part of large abdomen and small abdomen with longer thin setae; male without sexually modified setae, in female some circumanal setae modified, see below.

Head. Eye patches with 8+8 ommatidia, C and D apparently not smaller than others, 2+2 setae, cuticula between ommatidia coarser than on other parts of head; head apex with 5 (2-m-2) setae, frons rows a each 6, middle part 18 (15–23) setae; clypeus row a with 1–3 setae m, rows b–g with usual set of setae but setal pair d1 missing, region M with 18 (15–21) setae; ventral head-back without oval organs; mouthparts normal.

Antennae. Total length shorter than body. Segment I as usual; segment II whorls 1–4 with 2, 3–4, 3, 9 setae respectively; segment III only with thin normal setae, whorls 1–9 with 1,4,1,0,4,5,2,2,6 setae, i. e. setae of whorl 4 missing; segment IV with usual sensilla of whorl p1 but without postero-basal sensilliform setae PB (see Fig. 10), intermediate region T with 0–3 setae, distal part with 5 short subsegments, with 5 antero-dorsal sensilla, 4 postero-dorsal sensilla (large sensillum P in whorl 6, i. e. behind tip, Fig. 5), 2 ventral sensilla in whorl 4 and 5, and tip with 12 distal sensilla.

Large abdomen. Row 5 with 1 seta, i. e. without ventral seta; formula of flank-setae 5/+.

Small abdomen. Genital papilla in female with about 14, in male 7+7 setae. In female, segment VI without median seta, with A : 3, DL : 2, P : 2, 5 dorsal circumanal setae (a0, a1, a2) and 5 pairs of ventral ones (av1–5, av1' missing); dorsal and ventral anal valves with 1 pair of oval organs each; seta a0 normal, a1 forked, a2 broad and ventrally fringed, av1 also broad and dorsally fringed, av2–av4 long and strong (Fig. 6); appendices anales (= av5) (Fig. 6) short bandlike, tip cut and toothed. In male, chaetotaxy of segment VI as in female except only 1 pair DL and 3 dorsal circumanal setae (a0 and a1); oval organs not as constant as in female.

Legs. Chaetotaxy of coxa and trochanter as usual. Femur I without secondary setae p1 and m2; femur II without primary seta m2; femur III without secondary setae p5 and m6, sometimes seta m2 transformed into an oval organ, primary seta d7 missing. Tibiotarsi I–III rows p with 4/5, 3/4, 2/3 setae and distal part with 3, 3, 2 spatulate setae respectively (Fig. 7), inner sides with some obliquely truncated or distally flattened setae, tibiotarsus I seta Ja thin and not appressed, each tibiotarsus without seta Ia but with seta Ii and with 2 oval organs in position 2pe, 3pe. All claws and empodia of same shapes (Fig. 7); claws with minute outer and inner tooth; empodia without lamellae directly tapering into straight filament or with minute inner point, each filament distally knobbed and slightly exceeding claws.

Furca. All setae normal. Manubrium with 6+6 setae (setae 2 and 3 missing); dens rows E with 7 setae, J with 4 distal and 1–2 proximal setae (sometimes 7 setae present), PE with 1, P with 7 setae, formula of anterior setae 4,2,1...1, the 2,1 middle setae longer than spaces between their bases; mucro (Fig. 8) smooth without or with narrow anterior furrow and round tip, seta missing.

Sanaaiella n. g.

Type species: *Sanaaiella quadripunctata* n. sp.

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

Head and anterior part of large abdomen with short and thin setae, posterior part of large abdomen and small abdomen with longer thin setae. Eye patches with 8+8 ommatidia, 2+2 setae, cuticula between ommatidia coarser than on other parts of head. Clypeus rows a–g with usual set of setae but setal pair d1 missing. Mouthparts normal. Antennae shorter than body, segment IV with postero-basal sensilliform setae PB (see Fig. 10), with distal dorso-posterior sensillum P on 3rd whorl behind tip, 2 ventral sensilla in whorls 4 (or 3) and 5, and tip with 12 distal sensilla. Each tibiotarsus with smooth setae and several obliquely truncated or distally flattened inner setae. Tibiotarsus I–III with 3, 3, 2 spatulate setae respectively, each tibiotarsus without seta Ia but with seta Iii, and 2 oval organs each in position 2pe, 3pe; tibiotarsus I seta Ja generally not appressed. Empodia without lamellae but with distinct inner point, each filament distally thin, straight, knobbed, and slightly exceeding claws. Dens with middle anterior setae longer than spaces between their bases. Mucro smooth with anterior furrow of various width, seta missing. Male without sexually modified setae; some circumanal setae of female thicker than others and bowed.

Derivatio nominis. The name of this new genus is derived from Sana'a, the capital of the Republic of Yemen, where many of the specimens described here have been collected. The gender is feminine.

Justification. *Sanaaiella* n. g. appears in the key in BRETFFELD (1999) in entry 21', i. e. near the genus *Cyprania* Bretfeld, 1992, from Cyprus. The new differs from this genus since the empodia have a larger point (instead of a short or minute point in *Cyprania*¹), in the female the circumanal setae are smooth (instead of toothed or fringed), the antennae have other proportions (in *Cyprania*, the segments III and IV are relatively shorter and the subsegments of segment IV are short), and the antennal segment IV has postero-basal sensilliform setae PB (instead of such setae missing).

These sensilla PB have not yet been observed in the Bourletiellida. They occur in row 7 of the proximal whorls p2, T, p3, d1, or d2 (Fig. 10); they are thinner and shorter than the normal setae but longer than the distal sensilla. These distal sensilla always occur in other rows, namely the antero-dorsal sensilla a and A between rows 1 and 2 and the postero-dorsal sensilla p and P between rows 7 and 8 (see Fig. 5) (the 2 ventral sensilla V occur between rows 5 and 6).

The combination of characteristics of *Sanaaiella* clearly differs from the known genera of the Bourletiellida.

¹ Since the empodia of *Cyprania* often appear short or even minute, this genus should be added in BRETFFELD (1999), p. 216, in entry 11 as: '*Cyprania* Bretfeld, 1992 (p. 232): males without secondary characteristics, females without furcate circumanal setae'.

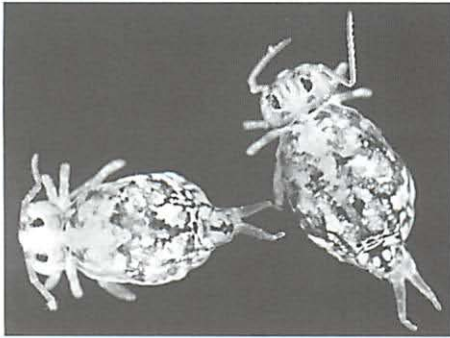


Fig. 9

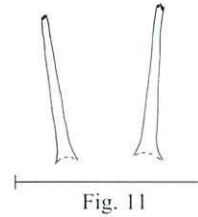


Fig. 11

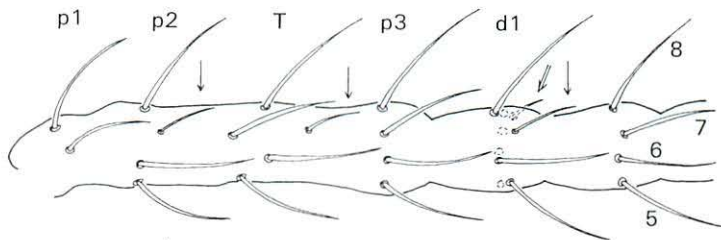


Fig. 10

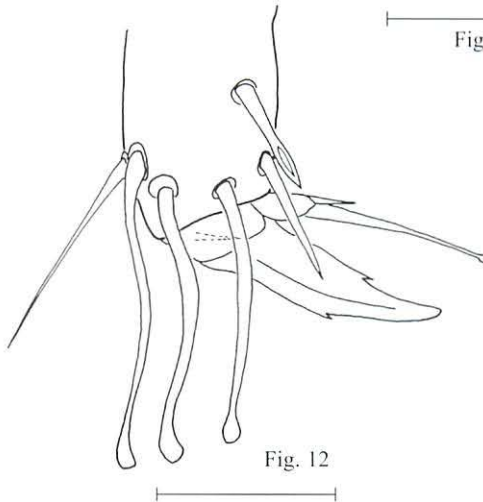


Fig. 12

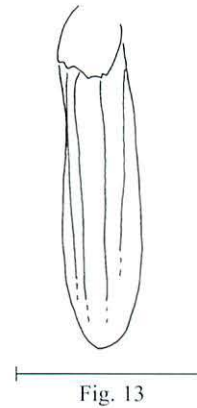


Fig. 13

Sanaaiella quadripunctata n. g. n. sp.

Fig. 9 Habitus and colour pattern of 2 females. Total lengths of head and body about 1 mm.

Fig. 10 Antennal segment IV basal whorls and posterior setal rows with senilla PB (simple arrows) and a1 (double arrow) (see text), (bar = 50 μ m)

Fig. 11 Appendices anales of 1 female (bar = 50 μ m)

Fig. 12 Tip of tibiotarsus II, claw, and empodium (bar = 20 μ m)

Fig. 13 Mucro (bar = 50 μ m)

Sanaaiella quadripunctata n. sp.

Holotype. Female (no. 4, on 4 slides) from sample 3032: Yemen, Sana'a, area of the International School on the outskirts of the town, pitfall traps near a dry mountain slope at about 2300 m altitude, III – IV/1998 leg. van Harten.

Paratypes. 114 specimens (females and males, in alc. and on slides) together with the holotype. – 1 female (in alc.) from sample 490: Yemen, Sana'a, Department of Plant Protection, agricultural testing farm in town centre at about 2300 m altitude, II/1991 leg. van Harten. – 3 females (in alc.) from sample 3165: same locality as the holotype but V/1998 leg. van Harten.

Derivatio nominis. The name of this new species is derived from the main pigmental spots of its large abdomen.

Diagnosis. A dark looking species of the genus *Sanaaiella* Bretfeld, see above, with 7 diagnostic characteristics:

- Dorsal side of spotted abdomen with 2+2 main spots,
- antennal segment IV with 2 – 3 sensilliform setae PB,
- antennal segment IV region T long,
- appendices anales long and thin with toothed tip,
- tibiotarsi I – III rows p with 7, 7, 4 setae respectively,
- dens with 3 distal and 2 proximal inner setae,
- formula of anterior setae of dens 4,2,1...1.

Other diagnostic characteristics as mentioned for the genus.

Description. The description and the nomenclature of the chaetotaxy refer to that of *Fasciosminthurus virgulatus* (Skorikov, 1899) (see BRETFFELD 1990, 1992) and *Cyprania gisae* Bretfeld, 1992 (see also BRETFFELD 1996).

Measurements and proportions (from 6 females and 3 males). Total female up to 1 mm, male 0.6 mm; head in female 0.33 mm, in male 0.25 mm; mucro in female 87 μm , in male 62 μm ; inner edge of claw III in female 23 μm , in male 17 μm ; appendices anales 37 (31 – 40) μm . Length of antennae : head diagonal = 1.9 in female, 2.1 in male; antennal segments I : II : III : IV = 1 : 2.1 : 3 : 7 in both sexes; subsegmented part of antennal segment IV : basal part = 2 in both sexes; manubrium : dens : mucro = 3 : 2.6 : 1 in both sexes; appendices anales : mucro = 0.42 (0.39 – 0.47); mucro : claw III inner edge = 3.8 in female, 3.6 in male; appendices anales : claw III inner edge = 1.6.

Colour (Fig. 9). Eye patches black; background colour whitish yellow with more or less intense blackish pigment. Head pigmented in middle parts, but broad median stripe on apex, frons and clypeus unpigmented or with longitudinal stripe or a few spots between eye patches or antennae; large abdomen with irregular spots on lateral and dorsal sides, dorso-posterior side with 2+2 black spots, ventral side unpigmented; small abdomen segment V with 1 dorsal band and 1+1 lateral spots, segment VI with median stripe or 1+1 pale 'eyes'; antennae blue, legs with spots on femora and tibiotarsi, furca unpigmented.

Chaetotaxy and special structures (applied to both sexes if not otherwise stated).

Head. Ommatidium D the smallest; head apex with 5 (2-m-2) setae, frons rows a each 6,

middle part 15 setae; clypeus region M with 10 – 15 setae; ventral head-back with 2+2 oval organs.

Antennae. Segment I as usual; segment II whorls 1 – 4 with 2, 4, 3, 9 setae respectively; segment III whorls 1 – 9 with 1, 3, 2, 2, 4, 5, 4, 2, 6 setae respectively; segment IV with usual sensilla of whorl p1 and with 2 – 3 postero-basal sensilliform setae PB (Fig. 10), intermediate region T with 11 setae in female and 8 in male, distal part with 5 long subsegments, 6 antero-dorsal sensilla, 4 postero-dorsal sensilla.

Large abdomen. Row 5 with 1 seta, i. e. without ventral seta; formula of flank-setae 6/+.

Small abdomen. Genital papilla in female with 18 setae, in male not certain. In both sexes, segment VI with 2 median setae and with A : 3, DL : 2, P : 2, 5 dorsal circumanal setae (a0, a1, a2) and 5 pairs of ventral ones (av1 – 5, av1' missing), dorsal and ventral anal valves with 1 pair of oval organs each; in female, circumanal setae a1, a2, av1, av3 thicker than others, smooth, and bowed; appendices anales (= av5) (Fig. 11) long, thin, and tapering but tip with small teeth.

Legs. Chaetotaxy of coxa and trochanter as usual. Femur I generally lacks seta m2. Tibiotarsi I – III rows p with 7, 7, 4 setae respectively and strong spatulate setae (Fig. 12). All claws and empodia of same shapes (Fig. 12); claws moderately broad with small outer and inner tooth; empodia with short inner point.

Furca. All setae normal. Manubrium often with only 7+7 setae (setae 3 missing); dens row E with 7 – 8 setae, J with 3 distal and 2 proximal setae, PE with 1, P with 7 setae, formula of anterior setae 4,2,1...1; anterior furrow of mucro of moderate width (Fig. 13).

Sanaaiella circumscripta n. sp.

Holotype. Female (on 3 slides) from sample 3117: Yemen, Ta'izz, Agricultural Research and Extension Authority, agricultural testing farm on the outskirts of the town at about 1500 m altitude, light-trap, 26./28. V. 1998 leg. van Harten.

Paratype. 1 juvenile (in alc.) together with the holotype.

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

Diagnosis. A small, light looking species of the genus *Sanaaiella* Bretfeld, see above, with 7 diagnostic characteristics:

- Dark pigment on dorsal parts of head and sides of large abdomen,
- antennal segment IV with 3 sensilliform setae PB,
- antennal segment IV region T short,
- appendices anales short bandlike with basal thickening and toothed tip,
- tibiotarsi I – III rows p with 4, 4/5, 4 setae respectively,
- dens with 3 distal and 2 proximal inner setae,
- formula of anterior setae of dens 4,2,1...1.

Other diagnostic characteristics as mentioned for the genus.

Description. The description and the nomenclature of the chaetotaxy refer to that of *Fasciosminthurus virgulatus* (Skorikov, 1899) (see BRETfeld 1990, 1992) and *Cyprania gisae* Bretfeld, 1992 (see also BRETfeld 1996).

Measurements and proportions (of the holotype female). Total length 0.6 mm; head 0.26 mm; mucro 56 μm ; inner edge of claw III 18 μm ; appendices anales 25 μm . Length of antennae : head diagonal = 1.7; antennal segments I : II : III : IV = 1 : 2.1 : 3.1 : 6; subsegmented part of antennal segment IV : basal part = 2.2; manubrium : dens : mucro = 3.4 : 3 : 1; appendices anales : mucro = 0.45; mucro : claw III inner edge = 3.1; appendices anales : claw III inner edge = 1.4.

Colour. Eye patches black; background colour of head and body whitish yellow with blackish blue pigment. Head with spots and shades on dorsal part, ventral part unpigmented; large abdomen with spotted horizontal band, posterior part of large abdomen and small abdomen segment V with broad black patch, segment VI with dark median stripe, dark tip, and 1+1 indistinct pale 'eyes'; antennae dark, legs and furca unpigmented.

Chaetotaxy and special structures (of the holotype female).

Head. Ommatidium D the smallest; head apex with 5 (2-m-2) setae, frons rows a each 6, middle part 16 setae; clypeus region M with 14 setae; ventral head-back with 2+2 oval organs.

Antennae. Segment I as usual; segment II whorls 1 – 4 with 2, 4, 3, 9 setae respectively; segment III whorls 1 – 9 with 1, 3, 2, 2, 3/4, 5, 4, 2/3, 6 setae respectively; segment IV with usual sensilla of whorl p1, with 3 postero-basal sensilliform setae PB (see Fig. 10) and 1 still longer sensilliform seta in the distally adjacent whorl d2, intermediate region T with 3 setae, distal part with 5 short subsegments, 5/6 antero-dorsal sensilla, 3 postero-dorsal sensilla.

Large abdomen. Setal pattern not distinct.

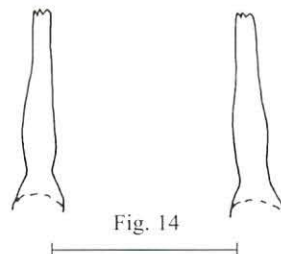
Small abdomen. Genital papilla in female destroyed. Segment VI with 2 median setae and with A : 3, DL : 2, P : 2, 5 dorsal circumanal setae (a0, a1, a2) and 5 pairs of ventral ones (av1 – 5, av1' missing), and 2+2 oval organs; circumanal setae a1, a2, av1 thicker than others, smooth, and bowed; appendices anales (= av5) (Fig. 14) short bandlike with basal thickening and toothed tip.

Legs. Chaetotaxy of coxa and trochanter as usual. Seta m2 missing in femur I, all setae present in femur II and III. Tibiotarsi I – III rows p with 4, 4/5, 4 setae respectively and with slender spatulate setae, tibiotarsus I seta Ja slightly appressed. All claws and empodia of same shapes; claws slender with small outer and inner tooth.

Furca. All setae normal. Manubrium with 8+8 setae; dens row E with 7 setae, J with 3 distal and 2 proximal setae, PE with 1, P with 7 setae, formula of anterior setae 4,2,1...1; anterior furrow of mucro of median width.

Sanaaiella circumscripta n. g. n. sp.

Fig. 14 Appendices anales of 1 female (bar = 25 μm)



Sanaaiella dorsopallida n. sp.

Holotype. Female (no. 2, on 3 slides) from sample 3032: Yemen, Sana'a, area of the International School on the outskirts of the town, pitfall traps near a dry mountain slope at about 2300 m altitude, III – IV/1998 leg. van Harten.

Paratypes. 54 specimens (females and males, in alc. and on slides) from sample 3032, together with the holotype. – 18 specimens (females and males, in alc.) from sample 3165, same locality as the holotype but V/1998 leg. van Harten. – 6 specimens (females and males, in alc. and on slides) from sample 3209, same locality as the holotype but VI/1998 leg. van Harten.

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

Diagnosis. A small, dark looking species of the genus *Sanaaiella* Bretfeld, see above, with 7 diagnostic characteristics:

- Head with large eye patches,
- large abdomen always with unpigmented dorsal side,
- antennal segment IV with 3 – 4 sensilliform setae PB,
- antennal segment IV region T short,
- appendices anales short bandlike with toothed tip,
- dens with 4 distal and 2 proximal inner setae,
- formula of anterior setae of dens 4,2,1,1...1.

Other diagnostic characteristics as mentioned for the genus.

Description. The description and the nomenclature of the chaetotaxy refer to that of *Fasciosminthurus virgulatus* (Skorikov, 1899) (see BRETFFELD 1990, 1992) and *Cyprania gisae* Bretfeld, 1992 (see also BRETFFELD 1996).

Measurements and proportions (from 6 females and 2 males). Total female up to 0.8 mm, male 0.5 – 0.6 mm; head in female 0.3 mm, in male 0.25 mm; mucro in female 70 µm, in male 60 µm; inner edge of claw III in female 18 µm, in male 16.5 µm; appendices anales 25.5 (22 – 28) µm. Length of antennae : head diagonal = 1.8 in female, 2 in male; antennal segments I : II : III : IV = 1 : 2 : 3 (2.8) : 6.8 (6.5) in female (and male); subsegmented part of antennal segment IV : basal part = 2 in both sexes; manubrium : dens : mucro = 3.3 : 2.7 : 1 in both sexes; appendices anales : mucro = 0.4 (0.3 – 0.5); mucro : claw III inner edge = 3.6 in both sexes; appendices anales : claw III inner edge = 1.4.

Colour. Eye patches black; background colour of head and body whitish yellow with reddish blue to grey-blue mostly diffuse pigment, in males darker than in females. Head unpigmented only between eye patches; large abdomen with broad horizontal band, in dark specimens also with ventral pigmentation, dorsal side always with oval unpigmented region; small abdomen segment V with dark dorsal cross stripe and 1+1 dark lateral spots, segment VI often dark with 1+1 pale 'eyes'; antennae blue, legs and furca unpigmented or in dark specimens with diffuse blue.

Chaetotaxy and special structures (applied to both sexes if not otherwise stated).

Head. Broad with large eye patches, ommatidium D the smallest; head apex with 5 (2-m-2) setae, frons rows a each 6, middle part 18 (16 – 21) setae; clypeus region M with 14 (12 – 17) setae; ventral head-back with 2+2 oval organs.

Antennae. Segment I as usual; segment II whorls 1 – 4 with 2, 4, 3, 9 setae respectively; segment III whorls 1 – 9 with 1, 3, 2, 2, 4, 5, 4, 3, 6 setae respectively; segment IV with usual sensilla of whorl p1 and with 3 postero-basal sensilliform setae PB (see Fig. 10) and 1 still longer sensilliform seta in the distally adjacent whorl, intermediate region T with 4 – 8 setae in female and 5 – 9 in male, distal part with 5 lengthened subsegments, 6 antero-dorsal sensilla, 4 (or 3) postero-dorsal sensilla.

Large abdomen. Row 5 with 1 (?) seta, i. e. apparently without ventral seta; formula of flank-setae 6/+.

Small abdomen. Genital papilla in female with 14 setae, in 1 male 8+9. In both sexes, segment VI with 2 median setae and with A : 3, DL : 2, P : 2, 5 dorsal circumanal setae (a0, a1, a2) and 5 pairs of ventral ones (av1 – 5, av1' missing), dorsal and ventral anal valves with 1 pair of oval organs each; in female, circumanal setae a1, a2, av1 thicker than others, smooth, and bowed; appendices anales (= av5) (Fig. 15) short bandlike with toothed tip, slightly bowed to the anterior.

Legs. Chaetotaxy of coxa and trochanter as usual. Seta m2 always missing in femur I, often in femur II. Tibiotarsi I – III rows p with 6 – 7, (5) 6 – 7, 3 – 4 (5) setae respectively and strong spatulate setae, each tibiotarsus with 2 (also 1 or 3) oval organs in position 2pe, 3pe (or only 2pe or also 4pe). All claws and empodia of same shapes (Fig. 16); claws basally quite broad, distally narrowed with small outer and inner tooth.

Furca. All setae normal. Manubrium with 8+8 setae; dens row E with (7) 8 setae, J with 4 distal and 2 proximal setae, PE with 1, P with 7 setae, formula of anterior setae 4,2,1,1...1; anterior furrow of mucro of moderate width.

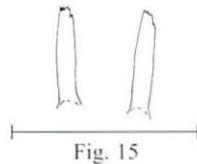


Fig. 15

Sanaaiella dorsopallida n. g. n. sp.

Fig. 15 Appendices anales of 1 female (bar = 50 μ m)



Fig. 16

Fig. 16 Claw and empodium II (bar = 20 μ m)

Sanaaiella intermaculata n. sp.

Holotype. Female (no.1, on 3 slides) from sample 1689: Yemen, Shuqrah-Lawdar, near a street between volcanic mountains at about 400 m altitude, 21. III. 1993 leg. van Harten.

Paratypes. 10 specimens (females and males, in alc. and on slides) together with the holotype. – 1 female (on slides) from sample S 106: Yemen, isle of Soqatra, Wadi Daneghan, near a small river at about 300 m altitude, 4. X. 1998 leg. van Harten.

Derivatio nominis. The name of this new species is derived from the pigmental pattern between its antennae.

Diagnosis. A large, dark spotted species of the genus *Sanaaiella* Bretfeld, see above, with 7 diagnostic characteristics:

- Dark pigmental spots on head, body, and between antennae,
- antennal segment IV with 3 sensilliform setae PB,
- antennal segment IV region T long,
- appendices anales long with toothed tip,
- tibiotarsi I – III rows p with 7, 7, 5 setae respectively,
- dens with 3 distal and 2 proximal inner setae,
- formula of anterior setae of dens 4,2,1...1.

Other diagnostic characteristics as mentioned for the genus.

Description. The description and the nomenclature of the chaetotaxy refer to that of *Fasciosminthurus virgulatus* (Skorikov, 1899) (see BRETfeld 1990, 1992) and *Cyprania gisae* Bretfeld, 1992 (see also BRETfeld 1996).

Measurements and proportions (from 2 females and 1 male). Total female up to 1.1 mm, male 0.8 mm; head in female 0.4 mm, in male 0.3 mm; mucro in female 100 μm , in male 85 μm ; inner edge of claw III in female 30 μm , in male 25 μm ; appendices anales 40 μm . Length of antennae : head diagonal = 2.1 in both sexes; antennal segments I : II : III : IV = 1 : 2.1 : 2.8 : 6.5 (6.3) in female (and male); subsegmented part of antennal segment IV : basal part = 1.6 in both sexes; manubrium : dens : mucro = 3.2 : 2.7 : 1 in both sexes; appendices anales : mucro = 0.4; mucro : claw III inner edge = 3.5 in both sexes; appendices anales : claw III inner edge = 1.4.

Colour (Fig. 17). Eye patches black; background colour of head and body whitish yellow with many irregular blackish blue spots. Head with lateral spots, mouth region, apex, and between eye patches unpigmented, complicated pigmental pattern between antennae; large abdomen with many spots, most intensive on lateral and posterior parts, few spots on dorsal, mostly none on ventral part; small abdomen segment V with broad dorsal band, lateral and ventral parts also pigmented, segment VI often with only a median stripe, in darker specimens completely pigmented with 1+1 pale dorsal 'eyes'; antennae blue, legs with blue spots, furca unpigmented.

Chaetotaxy and special structures (applied to both sexes if not otherwise stated).

Head. Ommatidium D the smallest; head apex with 5 (2-m-2) setae, frons rows a each 6, middle part 13 – 14 setae; clypeus region M with 13 – 15 setae; ventral head-back with 2+2 oval organs.

Antennae. Segment I as usual; segment II whorls 1 – 4 with 2, 4, 3, 9 setae respectively; segment III whorls 1 – 9 with 1, 3, 2, 2, 4, 5, 4, 2, 6 setae respectively; segment IV with usual sensilla of whorl p1 and with 3 postero-basal sensilliform setae PB (see Fig. 10), intermediate region T with 14 – 19 setae in female and 12 in male, distal part with 5 long subsegments, 6 antero-dorsal sensilla, and 4 postero-dorsal sensilla.

Large abdomen. Formula of flank-setae 6/+.

Small abdomen. Genital papilla in female with 17 and 21 setae, in male uncertain. In both sexes, segment VI with 2 median setae and with A : 3, DL : 2, P : 2, 5 dorsal circumanal setae (a0, a1, a2) and 5 pairs of ventral ones (av1 – 5, av1' missing), dorsal and ventral anal

valves with 1 pair of oval organs each; in female, circumanal setae a0, a1, a2, av1 thicker than others, smooth, and bowed, not wavy; appendices anales (= av5) (see Fig. 11) long, slender, and tapering with toothed tip.

Legs. Chaetotaxy of coxa and trochanter as usual. Both sexes lack seta m2 of femur I, male also lacks setae p5 and m6 of femur III. Tibiotarsi I – III rows p with 7, 7, 5 setae respectively and slender spatulate setae. All claws and empodia slender and of same shapes (Fig. 18); claws with small outer and inner tooth.

Furca. All setae normal. Manubrium with 8+8 setae; dens row E with 8 setae in females, 7 in male, J with 3 distal and 2 proximal setae, PE with 1, P with 7 setae, formula of anterior setae 4,2,1...1; anterior furrow of mucro broad or of moderate width.

Remarks. The abdominal pigmentation of *Sanaaiella intermaculata* n. sp. resembles that of *S. quadripunctata*. *S. intermaculata*, however, differs from that species in its more slender body, the lesser pigmented dorsal side of its abdomen, and the intensely spotted area between its antennae.

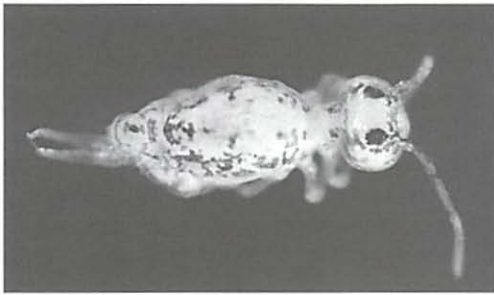


Fig. 17

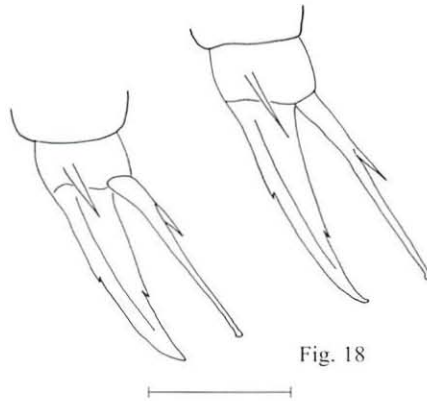


Fig. 18

Sanaaiella intermaculata n. g. n. sp.

Fig. 17 Habitus and colour pattern. Total length of head and body about 0.8 mm (male)

Fig. 18 Claw and empodium II (left) and III (bar = 20 μ m)

Sanaaiella multisensillata n. sp.

Holotype. Female (on 3 slides) from sample 843: Yemen, Al Mahwit-Khamis Bani Sa'd, slope of dry Wadi Dayan at about 1500 m altitude, 17. III. 1992 leg. van Harten.

Paratypes. 1 female, 2 males (1 female and 1 male in alc., 1 male on slides) together with the holotype.

Derivatio nominis. The name of this new species is derived from the increased number of its antennal sensilla PB.

Diagnosis. A light looking species of the genus *Sanaaiella* Bretfeld, see above, with 7 diagnostic characteristics:

- Abdomen with a horizontal band of black patches,
- antennal segment IV with 4 – 5 sensilliform setae PB,
- antennal segment IV region T long,

- appendices anales long bandlike with toothed tip,
- tibiotarsi I – III rows p with 7, 7, 4 – 5 setae respectively,
- dens with 4 distal and 2 proximal inner setae,
- formula of anterior setae of dens 4,2,1,1...1.

Other diagnostic characteristics as mentioned for the genus.

Description. The description and the nomenclature of the chaetotaxy refer to that of *Fasciosminthurus virgulatus* (Skorikov, 1899) (see BRETFFELD 1990, 1992) and *Cyprania gisae* Bretfeld, 1992 (see also BRETFFELD 1996).

Measurements and proportions. Total female up to 0.9 mm, male 0.7 mm; head in female 0.28 mm, in male 0.26 mm; mucro 77 μm in both sexes; inner edge of claw III in female 20 μm in both sexes; appendices anales 30 μm . Length of antennae : head diagonal = 2 in female, 2.2 in male; antennal segments I : II : III : IV = 1 : 2.2 : 3 : 7 in both sexes; subsegmented part of antennal segment IV : basal part = 1.6 in both sexes; dens : mucro = 2.6 in both sexes; appendices anales : mucro = 0.4; mucro : claw III inner edge = 3.8 in both sexes; appendices anales : claw III inner edge = 1.4.

Colour. Eye patches black; background colour of head and body whitish yellow with blue to black pigment. Head with lateral spots forming 1+1 longitudinal band on clypeus, dorsal part of head between eye patches, and median part down to clypeal edge unpigmented, only frontal eye region light blue; large abdomen with black spots forming a horizontal band, dorsal side with only a few spots, ventral side unpigmented; abdominal segment V with 1 dorsal spot and 1+1 lateral ones, segment VI more or less dark with 1 pigmented median line or with 1+1 pale 'eyes'; antennae grey, legs with blue stripes, furca unpigmented.

Chaetotaxy and special structures (applied to both sexes if not otherwise stated).

Head. Ommatidium D the smallest; head apex with 5 (2-m-2) setae, frons rows a each 6, middle part 16 and 17 setae; clypeus region M with 12 and 14 setae; ventral head-back without (male) or with 1+2 (female) oval organs.

Antennae. Segment I as usual; segment II whorls 1 – 4 with 2, 4, 3, 9 setae respectively; segment III whorls 1 – 9 with 1, 3, 2, 2, 4, 5, 4, 2, 6 setae respectively; segment IV with usual sensilla of whorl p1 and with 4 – 5 postero-basal sensilliform setae PB (see Fig. 10) and 1 still longer sensilliform seta in the distally adjacent whorl, intermediate region T with 15 – 17 setae, distal part with 5 lengthened subsegments, 6 antero-dorsal sensilla, 4 postero-dorsal sensilla.

Large abdomen. Setal pattern not distinct.

Small abdomen. Genital papilla in female with 14 setae, in 1 male 8+8. In female, segment VI with 2 median setae and with A : 3, DL : 2, P : 2, 5 dorsal circumanal setae (a0, a1, a2) and 5 pairs of ventral ones (av1 – 5, av1' missing), oval organs not distinct; circumanal setae a0, a1, a2, av1 thicker than others, smooth, and bowed; appendices anales (= av5) (Fig. 19) long bandlike with toothed tip. In male, chaetotaxy of segment VI not distinct.

Legs. Chaetotaxy of coxa and trochanter as usual. Seta m2 always missing in femur I, sometimes in femur II, seta m6 missing in femur III of male. Tibiotarsi I – III rows p with 7, 7, 4 – 5 setae respectively and with slender spatulate setae. All claws and empodia of same shapes; claws slender with small outer and inner tooth.

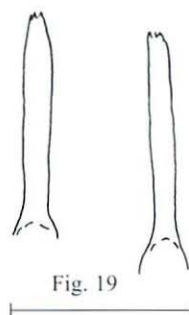
Tab. 1 Comparison of the new species of *Sanauiella* n. g.

	Colour	Setae of Ant III whorl 8	Post.-basal sensilla of Ant IV	Setae of Ant IV region T	Ant.-dist. sensilla of Ant IV	Post.-dist. sensilla of Ant IV	Setae of Tita I-III row p	Inner setae J of dens	Anter. setae of dens	App. anales
<i>S. quadripunctata</i>	large abd. 2+2 spots	2	2-3	8-14	6	4	7,7,3-4	3...2	4,2,1...1	long slender
<i>S. circumscripta</i>	black lateral band	2	3	3	5-6	3	4,4-5,4	3...2	4,2,1...1	short thickend
<i>S. dorsopallida</i>	diffuse but dorsal side pale	3	3	4-9	6	3-4	6-7,6-7,3-5	4...2	4,2,1,1...1	short
<i>S. intermaculata</i>	spots between antennae	2	3	12-19	6	4	7,7,5	3...2	4,2,1...1	long slender
<i>S. multisensillata</i>	small black lateral spots	2	4-5	15-17	6	4	7,7,4-5	4...2	4,2,1,1...1	long bandlike

Furca. All setae normal. Manubrium with 8+8 setae; dens row E with 8 setae, J with 4 distal and 2 proximal setae, PE with 1, P with 7 setae, formula of anterior setae 4,2,1,1...1; anterior furrow of mucro broad.

Sanaaiella multisensillata n. g. n. sp.

Fig. 19 Appendices anales of 1 female (bar = 25 µm)



Sanaaiella spec.

Material. (Ta'izz) sample 531: 2 females, 1 male; (Ibb-Ta'izz) 905: 1 male; (Wadi Hadramaut) 1026: 1 male; (Lahj) 3245: 2 females; (Lahj) 3321: 5 females; (Lahj) 3586: 16 specimens; (isle of Soqatra) S 75: 1 juv. female.

The structural characteristics of the prepared females of these samples are similar to *Sanaaiella quadripunctata*. The pigmentation of the mentioned specimens, however, partly resembles this species, partly differs, but these similarities and differences are not as distinct as they should be to describe these specimens as belonging to the same or different species. One has to wait for further collections which may provide more specimens of these populations and then may allow a better characterization of the species.

Sminthurus yemenensis n sp.

Holotype. Female (on 4 slides) from sample 795: Yemen, Al Hajjarah, near a mountain slope at about 2200 m altitude, 14. III. 1992 leg. van Harten. No further specimens known.

Derivatio nominis. This new species is named after the Republic of Yemen, where it was collected.

Diagnosis. A yellow species of the genus *Sminthurus* Latreille, 1802, with 5 diagnostic characteristics:

- Abdominal segment V with 2+2 setae above bothriotrichia D (apomorphy, plesiomorphy: 1+1 setae),
- upper setal pair of abdominal segment V short and ciliate (apomorphy, plesiomorphy: long and smooth),
- subcoxa III with 2 distal setae (apomorphy, plesiomorphy: 1 distal seta),
- ventral tube with 1+1 setae (plesiomorphy),
- claws without a tunica (plesiomorphy).

Other characteristics. Head and body with a light violet tint; postantennal setae of medium length and acuminate; appendices anales short; posterior edges of mucro smooth, seta present or absent.

Description. Measurements and proportions: Total length 1.7 mm; head 0.65 mm; mucro 140 μm ; appendices anales 70 μm . Length of antennae : head diagonal = 2; antennal segments I : II : III : IV = 1 : 2.1 : 2.9 : 7.3; dens : mucro = 3; appendices anales : mucro = 0.5.

Colour. Eye patches black; background colour of head and body yellow with light violet tint; antennae dark violet.

Chaetotaxy and special structures.

Head. Setae of apex normal but blunt; postantennal setae of medium length, acuminate, and rough.

Antennae. Segment II with 4 short ventral setae; segment III with 3 very long setae of proximal part; segment IV with 4 setae of basal whirl and 19 subsegments.

Small abdomen. Segment V with 2+2 setae above bothriotrichia D, dorsal pair A1 shorter than A2 and ciliate. Appendices anales (Fig. 20) slender, tip blunt, lateral edges lamellate and ciliate.

Legs. Subcoxa III with 2 distal setae. Femur III with antero-proximal seta p4. Tibiotarsus III seta Vi normal, row p with 7/8 setae. Claws with inner and small outer tooth and pseudonychia of medium length, tunica missing; empodia each with long apical point and filament, empodium I without outer tooth, empodia II and III with outer tooth, each filament not exceeding claw.

Ventral tube. 1+1 setae.

Retinaculum. 4 setae.

Furca. Dens row J with 7 setae, row P with additional seta P5 of one side, formula of anterior setae 3+1,3,3,2,2(1),1,1; both posterior edges of mucro smooth (Fig. 21), tip cut, seta present on one side and length 0.3 of mucro.

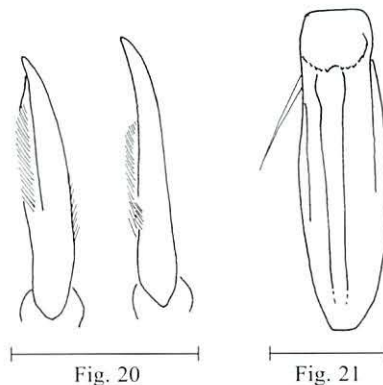
Remarks. *Sminthurus yemenensis* n. sp. appears in the key in BRETFELD (1999) near *S. leucomelanus* Nayrolles, 1995, and *S. hispanicus* Nayrolles, 1995 (with mucronal seta) or near *S. stachi* Betsch, 1977, and *S. wahlgreni* Uchida, 1948, (without mucronal seta). The first pair of species has other combinations of setae of the ventral tube and abdominal segment V and is intensely coloured; the second pair of species has different claws and short empodial filaments.

There is no comparable species described in the Palaearctic. From the adjacent regions of the Arabian Peninsula or Africa there is no *Sminthurus* species known at all.

Sminthurus yemenensis n. sp.

Fig. 20 Appendices anales of 1 female (bar = 50 μm)

Fig. 21 Mucro (bar = 50 μm)



Sphaeridia vanharteni n. sp.

Holotype. Male (on 2 slides) from sample 3165: Yemen, Sana'a, area of the International School on the outskirts of the town, pitfall traps near a dry mountain slope at about 2300 m altitude, V/1998 leg. van Harten. No further specimens known.

Derivatio nominis. This new species is named after Dr Antonius van Harten, the unremitting collector of arthropods and also of the remarkable Symphypleonan species described in this paper.

Diagnosis. A species of the genus *Sphaeridia* Linnaniemi, 1912, with 1 diagnostic apomorphy:

- Ventral tube with a lateral pair of shells and a posterior pair of short processes (plesiomorphy: with only 1+1 small posterior vesicles).

Other characters. Mucro slender with small inner teeth.

Description. Total length 0.2 mm, head 0.1 mm, mucro 40 μ m; ratio of dens : mucro = 1.9. Head and body dark blue. Head, thorax, and tibiotarsus III only with normal setae. Head frons with all setae. Tibiotarsus III seta IIpe long and pointed. Antennae and furca as in *S. pumilis*. Ventral tube (Fig. 22) with a lateral pair of soft leaves or shells covering the ventral tube sacs and with a posterior pair of short processes, setae of ventral tube hidden under the shells. Mucro (Fig. 23) slender with small inner teeth.

Remarks. The lateral leaves or shells of the ventral tube of *Sphaeridia vanharteni* n. sp. resemble those of *S. foliata* Bretfeld, 1997, from Algeria. The new species differs, however, from the latter in that the ventral tube has no median or other sclerotised structures. Thus, this new species cannot be placed in the *brevipila*-group of *Sphaeridia* species, the members of which have such a median structure (see BRETFFELD & GAUER 1994), nor can it be placed in another group mentioned in that paper, further specimens and related species have to be known first.

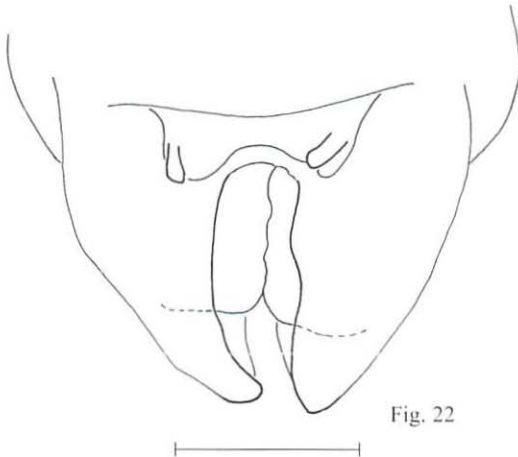


Fig. 22

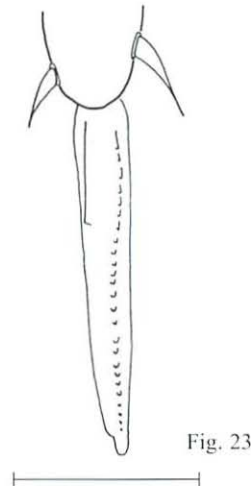


Fig. 23

Sphaeridia vanharteni n. sp.

Fig. 22 Ventral tube from posterior (bar = 20 μ m)

Fig. 23 Mucro (bar = 20 μ m)

Stenognathellus cf. *cassagnai*Fig. 24 Appendices anales of 1 female (bar = 20 μ m)*Stenognathellus* cf. *cassagnai* Yosii, 1966

Material. Sample 3165 : 11 specimens.

Colour reddish or brownish; mandibles and maxillae slender; abdominal segment V included in large abdomen; circumanal seta a0 simple, setae av1' (observed in 3 females) varying from normal to short and stout (microseta), or even missing; appendices anales with many branches (Fig. 24).

Since there are no distinct differences from *S. cassagnai*, the appendices anales of which have the same main shape but only 1 distal branch each, I temporarily assign these specimens to this species. *S. cassagnai* has been described from Nepal, thus I can hardly believe that it should also occur in Yemen (or in the Mediterranean, see BRETFFELD et al. 2001, in press).

Localities and their species

As a first step towards a geographical survey of the occurrence of the Symphypleona in the Republic of Yemen, the localities and their species are summarised. There were relatively few specimens collected; thus, the abundance of the species is directly related to the number of samples containing Symphypleona.

1. Sana'a, in the town centre and on the outskirts at about 2300 m altitude, 6 samples with 7 species: *Acutoempodialis lineatus*, *Anarmatus taizzus*, *Sanaaiella dorsopallida*, *Sanaaiella quadripunctata*, *Sphaeridia vanharteni*, *Stenognathellus* cf. *cassagnai*.
2. Ta'izz, on the outskirts at about 1500 m, 2 samples with 3 species: *Anarmatus taizzus*, *Sanaaiella circumscripta*, *Sanaaiella* spec.
3. Al Hajjarah, mountain slope at about 2200 m, 1 sample with 1 species: *Sminthurus yemenensis*.
4. Al Mahwit-Khamis Bani Sa'd, slope of dry wadi at about 1500 m, 1 sample with 1 species: *Sanaaiella multisensillata*.
5. Ibb-Ta'izz, near pass at about 2200 m, 1 sample with 1 species: *Sanaaiella* spec.
6. Wadi Hadramaut, desert with oases at about 1000 m, 1 sample with 1 species: *Sanaaiella* spec.

7. Shuqrah-Lawdar, between volcanic mountains at about 400 m, 1 sample with 1 species: *Sanaaiella intermaculata*.
8. Lahj, agricultural area at about 100 m, 3 samples with 1 species: *Sanaaiella* spec.
9. Isle of Soqotra, near the sea shore and at about 300 m, 2 samples with 2 species: *Sanaaiella intermaculata*, *Sanaaiella* spec.

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Author's address:

Dr. Gerhard Bretfeld
Zoologisches Institut der Universität Kiel
Olshausenstr. 40
24098 Kiel, Germany