

New species of *Sphaeridia* Linnaniemi, 1912, sensu Bretfeld & Trinklein 2000 (Insecta, Collembola) from Peru; with short descriptions of the males and a key to the *Sphaeridia* species described from South America.

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Abstract

From the soil surface of a tropical primary rain forest in Peru eight species of the genus *Sphaeridia* are described. Also a key is provided to all *Sphaeridia* species described from South America.

Keywords: Tropical primary rain forest, soil surface, Symphypleona

1. Introduction

The species diversity of the tropical primary rainforest is of a richness beyond any imagination. Especially near or in the soil there lives an overwhelming diversity of arthropod species. The present paper adds a little more to our knowledge about the species of these soil habitats. It deals with species living on the soil surface of a tropical primary rainforest in Peru.

2. Material and Methods

The *Sphaeridia* males studied here had been collected by M. von Tschirnhaus, University of Bielefeld, Germany, in Peru, Departamento Huánuco, at the Biological Station 'Panguana' of Prof. Dr H.-W. Koepcke, situated 9.37 S 74.56 W at 280 m altitude. The animals were collected by yellow pitfall traps from the surface of a tropical primary rain forest during 15 days in September 1981. The sample number of coll. v. Tschirnhaus is X 274.

The preparation method and the general chaetotaxic nomenclature are already published by the senior author (see especially Bretfeld 1999). Since this is a description of only the diagnostic characteristics of the males (see also Bretfeld & Gauer 1994), for more complete figures of the chaetotaxy of the *Sphaeridia* species see the papers of Dunger & Bretfeld (1989) and Fjellberg (2007), for example.

The whole number of Symphypleona out of the collection of M. v. Tschirnhaus and also the types of the studied *Sphaeridia* species are deposited at the Senckenberg Museum für Naturkunde, Görlitz, Germany.

3. Results

Sphaeridia decemdigitata n. sp.

Holotype: Male (no. 26, on three slides, coll. Bretfeld no. 27/95 m); Peru, Dep. Huánuco, biological station 'Panguana' of H.-W. Koepcke, tropical primary rainforest at 280 m altitude, yellow colour traps, IX/1981 leg. M. v. Tschirnhaus under no. X 274.

Paratype: Three males (no. 14, 34 and 35, on one slide each, coll. Bretfeld no. 27/95 m) together with the holotype.

Derivatio nominis: This new species is named after the five pairs of finger like processes of its ventral tube.

Diagnosis

A species of the genus *Sphaeridia* Linnaniemi, 1912, sensu Bretfeld & Trinklein 2000 with one diagnostic apomorphy: Ventral tube with a median, deeply forked posterior process and several pairs of pointed and of blunt lateral and distal processes (plesiomorphy: ventral tube with only 1+1 small posterior vesicles).

Description

Total length not determined. Eye-patches black, head, body and extremities blue, also mucrones with blue pigment. Chaetotaxy of head, dorsal body, antennae and furca without species specific modifications. Tibiotarsus III (Fig. 1) with only seta IIIpi with two small teeth or fringes, other setae of normal setal shape. Ventral tube (Fig. 2) with a deeply forked median process on the posterior side (shaded in Fig. 2) which has a basal spine protruding towards the anterior (the optical cross section of this spine is added in Fig. 2 as a detail); also five pairs of posterior processes present (1+1 long spines, 1+1 short spines, 1+1 processes with irregular tip and 2+2 blunt lobes). Furca with only the dental setae E1, J1 and J3 thickened.

Remarks

S. decemdigitata n. sp. belongs to the *brevipila*-group of *Sphaeridia* species because of the median process of its ventral tube (Bretfeld & Gauer 1994). It appears in the key in Bretfeld & Gauer (1994) near *S. catapulta* Bretfeld & Gauer, 1994 and in the new key (see below) near *S. chisacae* Bretfeld & Gauer, 1994, but differs clearly from these species in having the special structures on its ventral tube.

Sphaeridia multispina n. sp.

Holotype: Male (no. 11, on one slide, coll. Bretfeld no. 27/95 m); Peru, Dep. Huánuco, biological station 'Panguana' of H.-W. Koepcke, tropical primary rainforest at 280 m altitude, yellow colour traps, IX/1981 leg. M. v. Tschirnhaus under no. X 274. No further specimen known.

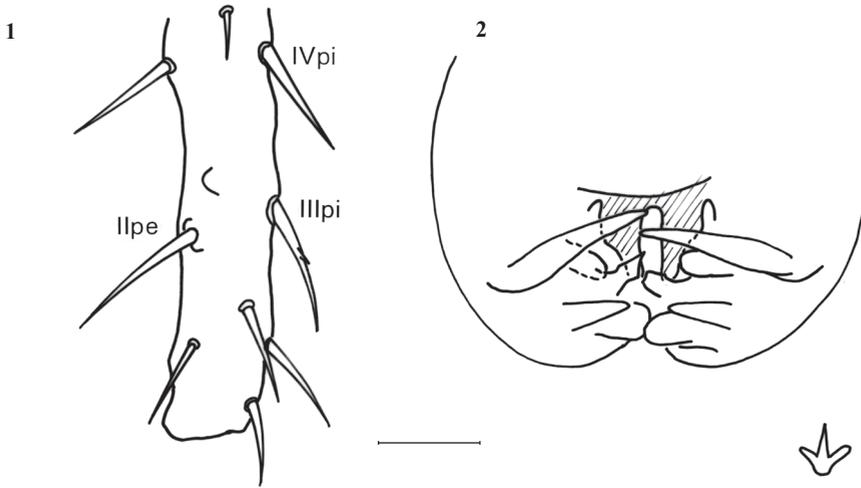
Derivatio nominis: This new species is named after the numerous spines of its antennae.

Diagnosis

A species of the genus *Sphaeridia* Linnaniemi, 1912, sensu Bretfeld & Trinklein 2000 with one diagnostic characteristic: Antennal segments II and III with numerous spines instead of one large spine each, thus not forming a clasping organ.

Description

Total length not determined. Eye-patches dark, head, body and extremities with only weak blue pigment. Chaetotaxy of head, dorsal body and furca without species specific modifications.



Figs 1–2 *Sphaeridia decemdigitata*. 1: Tip of tibiotarsus III (bar = 10 µm). 2: Ventral tube seen from the posterior (bar = 10 µm).

Antennal segments II and III (Fig. 3) without deformations and spines forming a clasping organ, but these segments and its setae of normal form, only the dorsal setae thicker than the other ones of these segments and all directed towards the tip of the antennae, i. e. also long sensilla-like setae are absent. Tibiotarsus III (Fig. 4) with setae IIIpi and IVpi with small teeth, other setae of normal setal shapes. Ventral tube (Fig. 5) without species specific modifications, i. e. only with 1+1 normal setae, the usual small vesicles of these simple ventral tubes not recognized. Furca with only the dental setae E1, J1 and J3 basally thickened.

Remarks

Besides *Sphaeridia aspinosa* Bretfeld & Trinklein, 2000 from Ecuador, *S. multispina* n. sp. is the second species of the genus *Sphaeridia* known without clasping antennae in the male. These species differ from each other by their ventral tube structures and by the setal form of their antennae.

We cannot exclude that the antennae of the new species are an anomaly of the usual clasping organ because in the samples there was found only one male; we wish to call this a new species, however, because of the distinct form of the antennal segments and setae.

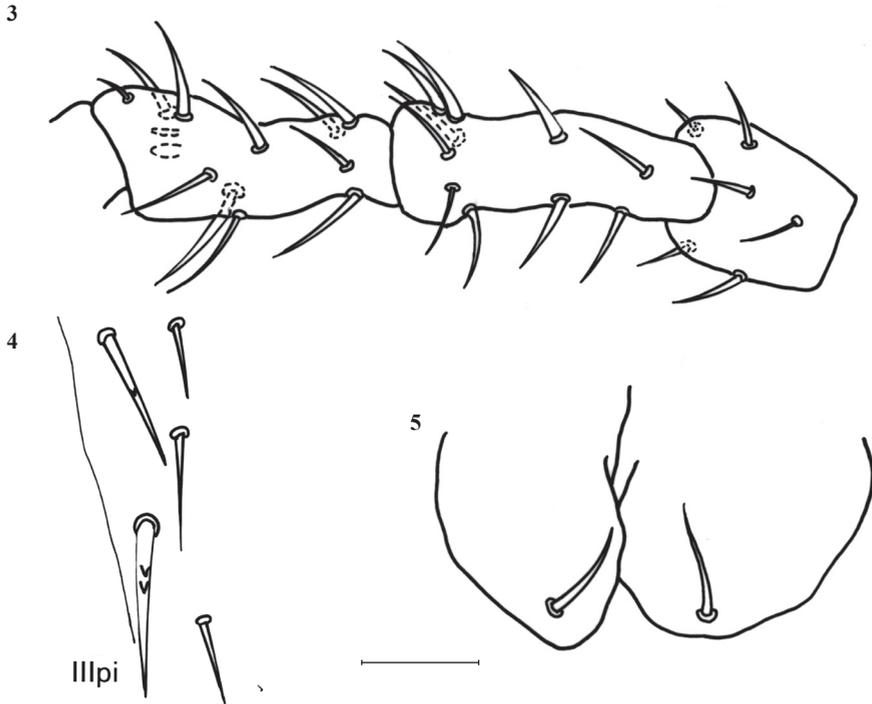
S. aspinosa belongs to the *brevipila*-group of *Sphaeridia* species because of the median process of its ventral tube (Bretfeld & Gauer 1994) whereas *S. multispina* n. sp. belongs to the *pumilis*-group of *Sphaeridia* species (Bretfeld & Gauer 1994) because of the simple posterior side of its ventral tube. Both species differ also in the shape of antennal setae; in *S. aspinosa* there are the usual long sensilla-like setae on the antennal segments II and III besides normal and thin ones, whereas in *S. multispina* n. sp. all setae of antennal segments II and III are rather short and stout, i. e. without long sensilla-like setae.

In the new key (see below) these species appear next to each other because they lack clasping antennae.

Sphaeridia panguanae n. sp.

Holotype: Male (no. 22, on three slides, coll. Bretfeld no. 27/95 m); Peru, Dep. Huánuco, biological station 'Panguana' of H.-W. Koepcke, tropical primary rainforest at 280 m altitude, yellow colour traps, IX/1981 leg. M. v. Tschirnhaus under no. X 274.

Paratype: Male (no. 24, on three slides, coll. Bretfeld no. 27/95 m) together with the holotype.



Figs 3–5 *Sphaeridia multispina*. **3:** Right antennal segments I–III seen from the anterior (bar = 10 μ m). **4:** Modified setae of tibiotarsus III (bar = 10 μ m). **5:** Ventral tube seen from the posterior (bar = 10 μ m).

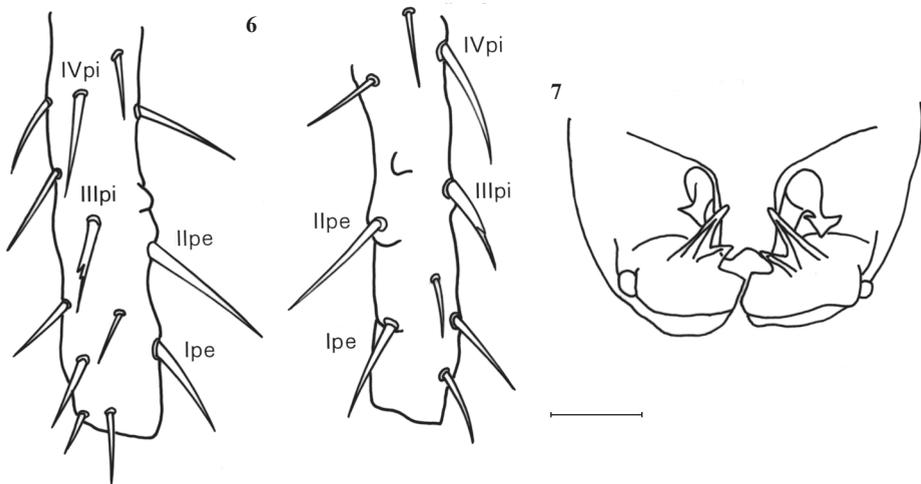


Fig 6–7 *Sphaeridia panguanae*. **6:** Two different views of the tips of tibiotarsus III (bar = 10 μ m). **7:** Ventral tube seen from the posterior (bar = 10 μ m).

Derivatio nominis: This new species is named after the biological station 'Panguana' of H.-W. Koepcke, where the species described in this paper had been collected.

Diagnosis

A species of the genus *Sphaeridia* Linnaniemi, 1912, sensu Bretfeld & Trinklein 2000 with one diagnostic apomorphy: Ventral tube with a thick median posterior process with a slight apical notch and another two pairs of posterior processes, one with several points and one forked (plesiomorphy: ventral tube with only 1+1 small posterior vesicles).

Description

Total length not determined. Eye-patches black, blue pigment on head especially in the mouth region and on antennal segment IV, pigment in the furca extends into the mucro. Chaetotaxy of head and antennae normal, that of body uncertain. Tibiotarsus III (Fig. 6) with setae Ipe, IIpe, IIIpi and IVpi slightly thickened and seta IIIpi with a short tooth. Ventral tube (Fig. 7) with a thick median posterior process, apparently a soft one, with a slight apical notch, and with further 2+2 posterior processes, one pair slender and bent with two or three distal points like arrowheads, the other as a pair of strong forks with a long and a short point each; setae not recognized. Furca with only the dental setae E1, J1 and J3 thickened.

Remarks

S. panguanae n. sp. belongs to the *brevipila*-group of *Sphaeridia* species because of the median process on its ventral tube (Bretfeld & Gauer 1994). It appears in the key in Bretfeld & Gauer (1994) near *S. carioca* Arlé, 1984 and in the new key (see below) near *S. vampyra* n. sp., the processes on their ventral tubes, however, differ clearly.

Sphaeridia peruensis n. sp.

Holotype: Male (no. 39, on one slide, coll. Bretfeld no. 27/95 m); Peru, Dep. Huánuco, biological station 'Panguana' of H.-W. Koepcke, tropical primary rainforest at 280 m altitude, yellow colour traps, IX/1981 leg. M. v. Tschirnhaus under no. X 274.

Paratypes: Three males (no. 21, 32 and 41, on three, three and one slide respectively, coll. Bretfeld no. 27/95 m) together with the holotype.

Derivatio nominis: The new species is named after the Republic of Peru, where the *Sphaeridia* species described in this paper had been collected.

Diagnosis

A species of the genus *Sphaeridia* Linnaniemi, 1912, sensu Bretfeld & Trinklein 2000 with three diagnostic apomorphies: Tibiotarsus III with seta IIpe as a pointed blade, seta IIIpi with a thick and roundish tooth (plesiomorphy: both setae of normal setal shape); ventral tube with several roundish processes and 1+1 strong spines (plesiomorphy: ventral tube with only 1+1 small posterior vesicles); furca with 2+2 strong hooks on the manubrium and dentes (plesiomorphy: only normal setae at the positions of these hooks).

Description

Total length of male 0.2 mm. Eye-patches black, head and body dark blue, antennae paler but segment IV dark, only basal segments of legs blue, furca completely blue (i. e. mucro included). Head frons with all setae present and all of normal shape, setae of thorax not recognized. Antennae with a normal set of setae and a clasping organ as usual. Tibiotarsus III (Fig. 8) with seta Ipe strong and straight, seta IIpe as a striated, pointed blade, seta IIIpi

with a thick and roundish tooth and a long point, seta IVpi of normal setal shape. Ventral tube (Figs 9, 10) with several pairs of processes, one irregular pair on posterior side and several roundish ones on lateral sides, and 1+1 long, blunt spines; the pair of setae not recognized. Furca (Figs 11, 12) on the posterior sides of the manubrium and the basal parts of dentes with a pair of strong hooks each, all posterior setae of dentes also thickened, especially setae E1, J1 and J3 basally thickened.

Remarks

S. peruensis n. sp. belongs to the *irmleri*-group of *Sphaeridia* species (Bretfeld & Gauer 1994) because its ventral tube lacks a median process but has complicated posterior structures. It appears in the key in Bretfeld & Gauer (1994) near *S. fibulifera* Bretfeld & Gauer, 1994 but differs from that species by the shape of setae of its tibiotarsus III and by the hooks of its furca. In the new key (see below) this species has been given a special position because of the unique hooks of its furca.

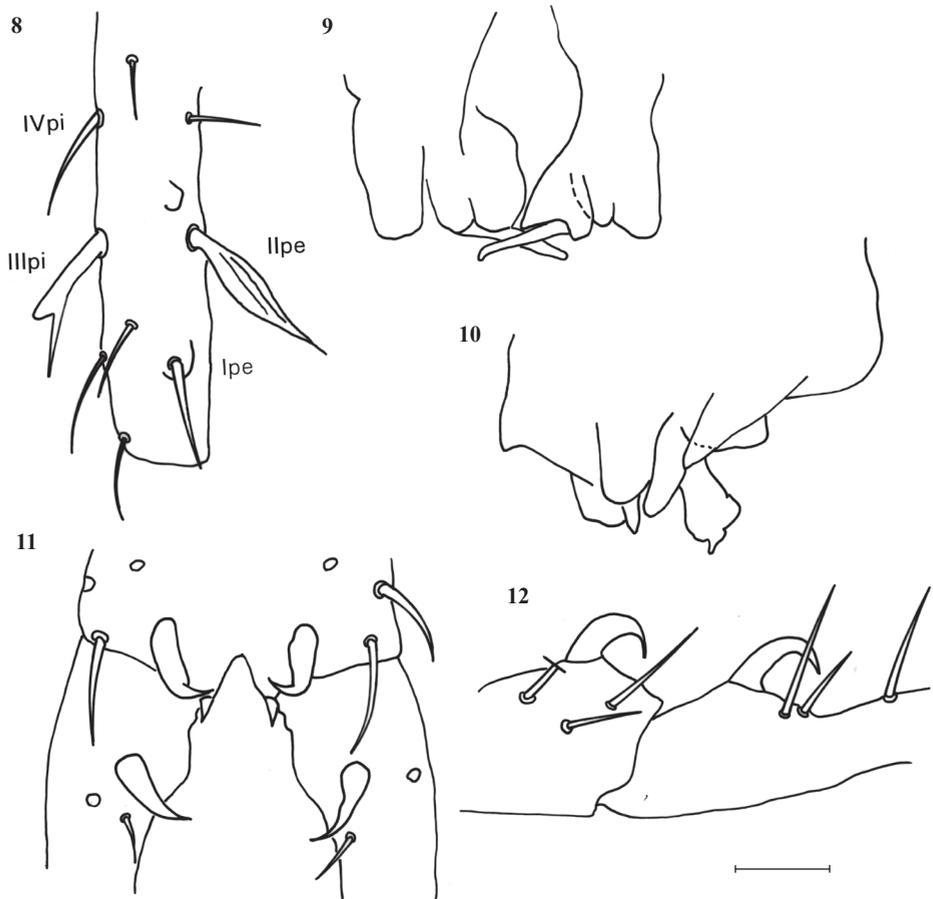


Fig 8–12 *Sphaeridia peruensis*. **8:** Tip of tibiotarsus III (bar = 10 µm). **9:** Ventral tube seen from the posterior (bar = 10 µm). **10:** Ventral tube seen from the left (bar = 10 µm). **11:** Manubrium and bases of dentes seen from the posterior (bar = 10 µm). **12:** Manubrium and bases of dentes seen from the left (bar = 10 µm).

***Sphaeridia torifera* n. sp.**

Holotype: Male (no. 42, on three slides, coll. Bretfeld no. 27/95 m); Peru, Dep. Huánuco, biological station 'Panguana' of H.-W. Koepcke, tropical primary rainforest at 280 m altitude, yellow colour traps, IX/1981 leg. M. v. Tschirnhaus under no. X 274.

Paratypes: Two males (no. 12 and 30, on three slides each, coll. Bretfeld no. 27/95 m) together with the holotype.

Derivatio nominis: The name of this new species means bearing (lat. fero) bulges (lat. tori) because of the thick lobes of its ventral tube.

Diagnosis

A species of the genus *Sphaeridia* Linnaniemi, 1912, sensu Bretfeld & Trinklein 2000 with two diagnostic apomorphies: Tibiotarsus III with seta IIpe as a pointed blade, seta IIIpi and IVpi with small teeth or fringes (plesiomorphy: all setae of normal setal shape); ventral tube on posterior side with a blunt median process and on distal part with 1+1 irregular lobes (plesiomorphy: ventral tube with only 1+1 small posterior vesicles).

Description

Total length not determined. Eye-patches black, head and body with many small blue spots. Chaetotaxy of head, dorsal body, antennae and furca without species specific modifications. Tibiotarsus III (Fig. 13) with seta Ipe strong and straight, seta IIpe as a striated blade (or vesicle?) with a waved and pointed tip, seta IIIpi with some basal fringes and seta IVpi with a short, blunt tooth. Ventral tube (Figs 14, 15) with a pair of normal setae, one blunt median process on posterior side and 1+1 irregular distal processes resembling soft bulges. Furca with only the dental setae E1, J1 and J3 basally thickened.

Remarks

S. torifera n. sp. belongs to the *brevipila*-group of *Sphaeridia* species because of the median process on its ventral tube (Bretfeld & Gauer 1994). It appears in the new key (see below) near *S. heloisae* Arlé, 1984, but differs clearly from that species by the different form of the blade-like seta IIpe of its tibiotarsus III.

***Sphaeridia tropica* n. sp.**

Holotype: Male (no. 9, on one slide, coll. Bretfeld no. 27/95 m); Peru, Dep. Huánuco, biological station 'Panguana' of H.-W. Koepcke, tropical primary rainforest at 280 m altitude, yellow colour traps, IX/1981 leg. M. v. Tschirnhaus under no. X 274.

Paratype: Two males (no. 1 and 36, on two and three slides respectively, coll. Bretfeld no. 27/95 m) together with the holotype.

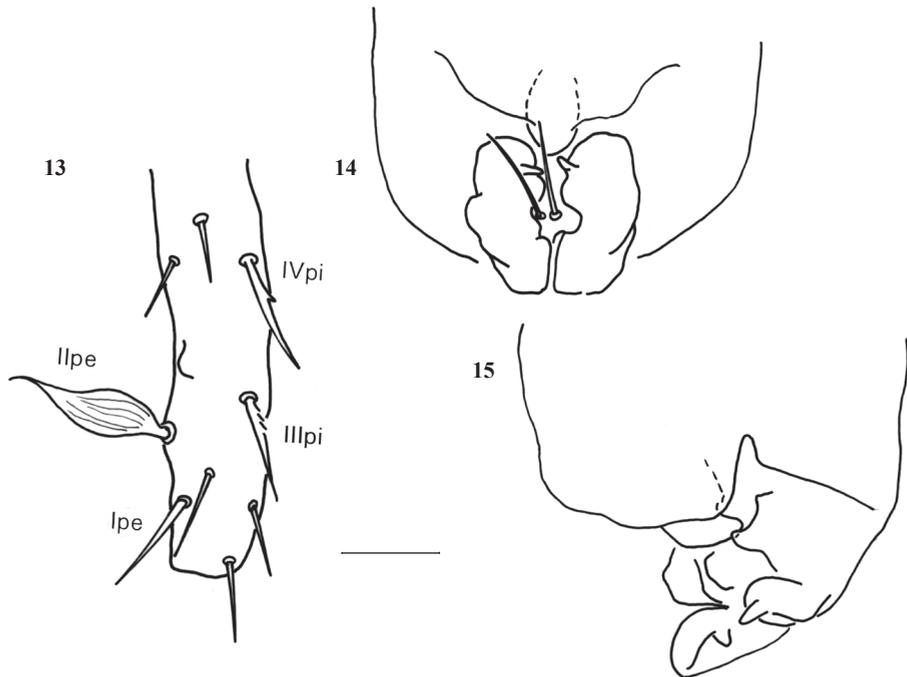
Derivatio nominis: This new species is named after the tropical habitat of the type locality.

Diagnosis

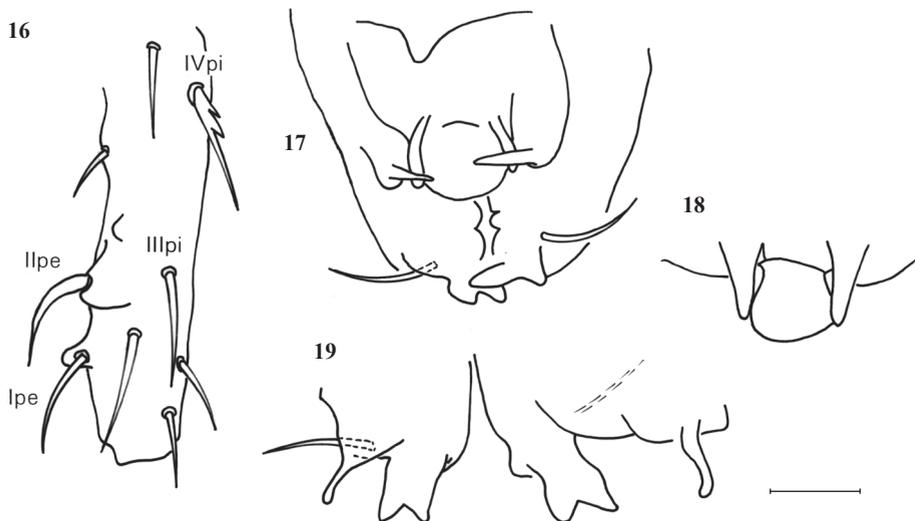
A species of the genus *Sphaeridia* Linnaniemi, 1912, sensu Bretfeld & Trinklein 2000 with two diagnostic apomorphies: Tibiotarsus III with seta IIpe strong and curved on a thick socket, seta IVpi with two strong teeth (plesiomorphy: all setae of normal setal shape and sockets not thickened); ventral tube with a median posterior blade, 2+2 finger like posterior spines and 1+1 irregular lobes (plesiomorphy: ventral tube with only 1+1 small posterior vesicles).

Description

Total length not determined. Eye-patches black, head and body with blue pigment, head light blue, large abdomen blue on dorsal side especially, antennae light blue but segment IV darker.



Figs 13–15 *Sphaeridia torifera*. **13**: Tip of tibiotarsus III (bar = 10 μ m). **14**: Ventral tube seen from the posterior (bar = 10 μ m). **15**: Ventral tube seen from the right (bar = 10 μ m).



Figs 16–19 *Sphaeridia tropica*. **16**: Tip of tibiotarsus III (bar = 10 μ m). **17**: Ventral tube seen from the posterior (bar = 10 μ m). **18**: Detail of ventral tube seen from the posterior (bar = 10 μ m). **19**: Detail of the lobes of ventral tube of another specimen (bar = 10 μ m).

Chaetotaxy of head, dorsal body, antennae and furca without species specific modifications. Tibiotarsus III (Fig. 16) with seta Ipe of normal setal shape but on a thick socket, seta IIpe strong and bent, also on a thick socket, seta IIIpi strong and straight and seta IVpi with two strong teeth. Ventral tube (Figs 17–19) with a pair of normal setae and several complicated but symmetrical structures: one median posterior blade, 2+2 finger-like posterior spines and 1+1 irregular lobes. Furca with only the dental setae E1, J1 and J3 thickened.

Remarks

S. tropica n. sp. belongs to the *brevipila*-group of *Sphaeridia* species because of the median process of its ventral tube (Bretfeld & Gauer 1994). It appears in the key in Bretfeld & Gauer (1994) and in the new key (see below) near *S. mandibulata* Bretfeld & Gauer, 1994. In the new key it appears also near the other two species with a symmetrical membrane on the posterior side of their ventral tube, i. e. *S. catapulta* Bretfeld & Gauer, 1994 and *S. coronata* Bretfeld & Gauer, 1994. *S. tropica* n. sp. distinctly differs from these three species by its ventral tube structures.

Sphaeridia tschirnhausi n. sp.

Holotype: Male (no. 2, on two slides, coll. Bretfeld no. 27/95 m); Peru, Dep. Huánuco, biological station 'Panguana' of H.-W. Koepcke, tropical primary rainforest at 280 m altitude, yellow colour traps, IX/1981 leg. M. v. Tschirnhaus under no. X 274.

Paratype: Male (no. 19, on three slides, coll. Bretfeld no. 27/95 m) together with the holotype.

Derivatio nominis: This new species is thankfully dedicated to Prof. Dr Michael von Tschirnhaus, University of Bielefeld, Germany, who collected the rich material of soil arthropods a small fraction of which is described here.

Diagnosis

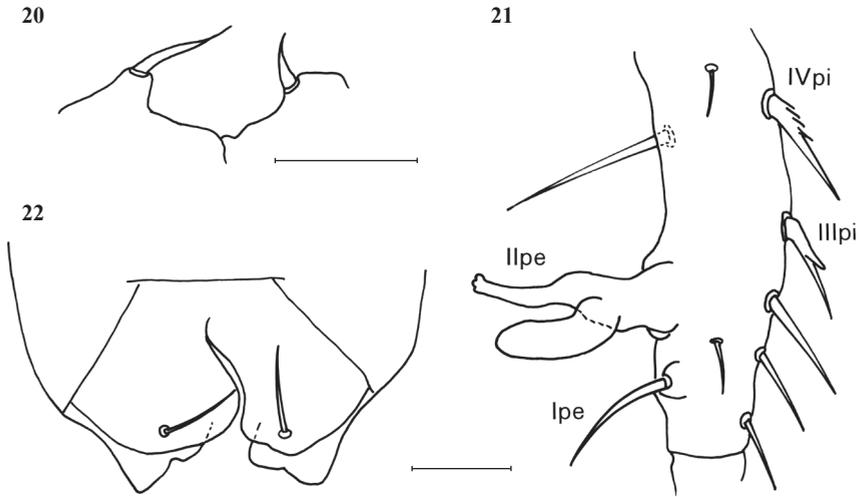
A species of the genus *Sphaeridia* Linnaniemi, 1912, sensu Bretfeld & Trinklein 2000 with three diagnostic apomorphies: Tibiotarsus III with a very thick and bipartite seta IIpe (plesiomorphy: this seta of normal setal shape); ventral tube with 1+1 roundish but notched anterior lobes (plesiomorphy: ventral tube with only 1+1 small posterior vesicles); claspings organ of antennae with both spines waved (plesiomorphy: these spines straight).

Description

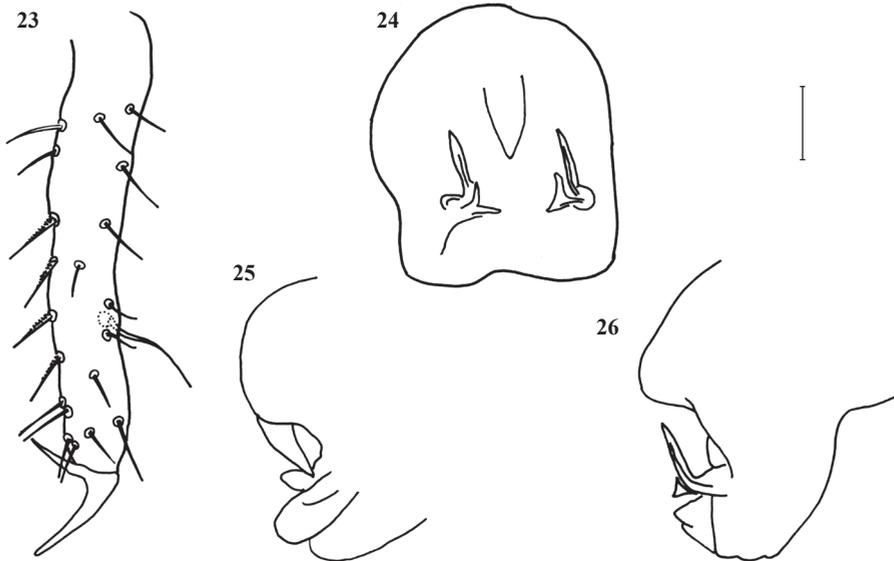
Total length of male 0.18 mm. Eye-patches black, head, body and extremities with dark violet-brown pigment. Head frons with all setae present and of normal shape, also thorax with only normal dorsal setae. Antennae with a normal set of setae, but claspings organ with waved spines (Fig. 20). Tibiotarsus III (Fig. 21) with a very thick seta IIpe split into two differing lobes, one roundish, one straight, seta IIIpi with one strong tooth, seta IVpi with a few basal fringes. Ventral tube (Fig. 22) on posterior side with 1+1 long, normal setae, without other structures, vesicles not recognised, anterior side with 1+1 roundish and notched lobes. Furca with all posterior setae of dentes thickened, thus setae E1 and J1 also thicker than usual.

Remarks

S. tschirnhausi n. sp. belongs to the *pumilis*-group of *Sphaeridia* species because of the simple posterior side of its ventral tube (Bretfeld & Gauer 1994). It appears in the key of Bretfeld & Gauer (1994) and in the new key (see below) near *S. aserrata* Mari Mutt, 1987, but differs from that species by the extremely thick seta IIpe of its tibiotarsus III.



Figs 20–22 *Sphaeridia tschirnhausi*. **20**: Spines of antennal segments II and III (bar = 20 μ m). **21**: Tip of tibia-tarsus III (bar = 10 μ m). **22**: Ventral tube seen from the posterior (bar = 10 μ m).



Figs 23–26 *Sphaeridia vampyra*. **23**: Tibiotarsus III (bar = 12.5 μ m). **24**: Ventral tube seen from the posterior (bar = 12.5 μ m). **25**: Ventral tube seen from the right, median plane (bar = 12.5 μ m). **26**: Ventral tube seen from the right, lateral plane (bar = 12.5 μ m).

***Sphaeridia vampyra* n. sp.**

Holotype: Male (no. 20, on one slide, coll. Bretfeld no. 27/95 m); Peru, Dep. Huánuco, biological station 'Panguana' of H.-W. Koepcke, tropical primary rainforest at 280 m altitude, yellow colour traps, IX/1981 leg. M. v. Tschirnhaus under no. X 274.

Paratypes: 24 males (no. 1, 6, 7, 8, 13, 15, 16, 17, 18, 23, 25, 27, 28, 29, 31, 37, 38, 40, 43, 44, 45 on one slide each, no. 3 on two slides, no. 4 on three slides, no. 5 on two slides, coll. Bretfeld no. 27/95 m) together with the holotype.

Derivatio nominis: This new species is named after the spines on its ventral tube which on the first glance looked as terrible as the teeth of a vampire.

Diagnosis

A species of the genus *Sphaeridia* Linnaniemi, 1912, sensu Bretfeld & Trinklein 2000 with one diagnostic apomorphy: Ventral tube with 1+1 long and 1+1 short and forked pointed processes on posterior side (plesiomorphy: ventral tube with only 1+1 small posterior vesicles).

Description

Total length of male 0.16 mm. Eye-patches black, head and body with blue pigment, some specimens with paler dorsal sides. Head frons with all setae present and of normal shape, also thorax with only normal dorsal setae. Antennal segment II and III form a normal clasping organ. Tibiotarsus III (Fig. 23) with a thin and waved seta IIpe, other setae of normal length. Ventral tube (Figs 24–26) on posterior side with a thick but pointed median process and two pairs of pointed processes, 1+1 long and 1+1 short and forked. Furca without species specific characteristics.

Remarks

S. vampyra n. sp. belongs to the *brevipila*-group of *Sphaeridia* species because of the median process of its ventral tube (Bretfeld & Gauer 1994). Its ventral tube resembles that of *S. pippetii* Murphy, 1966, but in this species the pair of posterior processes is short and forms a pair of hooks. It appears in the key in Bretfeld & Gauer (1994) near *S. carioca* Arlé, 1984, and in the new key (see below) near *S. panguanae* n. sp., but differs from these species by the different shape of the processes of its ventral tube.

Key to the *Sphaeridia* species of South America

This key deals with all *Sphaeridia* species described from South America and replaces that in Bretfeld & Gauer (1994). It contains the species mentioned in that key and also those described by Bretfeld (1997, 2002), Bretfeld & Trinklein (2000) and in this paper. In contrast to the former key, in the new one the species groups suggested by Bretfeld & Gauer (1994) are not principally maintained but a more direct way of determination has been chosen.

The abbreviations mean: Ant II or III – antennal segment II or III; post – posterior; ant – anterior; lat – lateral; proc – process or processes; Tita I, II, III – tibiotarsus I, II, III; VT – ventral tube.

Four species are not included in the key because the males were not at all or incompletely described (the same as mentioned in Bretfeld & Gauer 1994): *S. biniserrata* Salmon, 1951, sensu Arlé 1984 from Brazil (Tita III seta IIpe asymmetrically forked, both parts pointed, the proximal one shorter than the distal, Tita III without toothed setae, VT unknown), *S. gladiolifer* sensu Delamare Deboutteville & Massoud 1964 from Surinam (described only after females), *S. pumilis* (Krausbauer, 1898) sensu Delamare Deboutteville & Massoud 1964 from Surinam (no significant male characteristic described), *S. pumilis* (Krausbauer, 1898) sensu Arlé 1984 from Brazil (no significant male characteristic described).

1	Female	2
–	Male	3
2	Distal parts of Tita I–III with 2, 2, 3 spatulate setae, Tita III also with a strong, hooked seta <i>duckei</i> Bretfeld, 2002	
–	Setae of Tita I–III only pointed, Tita III setae IIpi and IVpi may be toothed or serrate females of all other species known	
3	Ant II and III without a strong spine each, thus not forming a clasping organ	4
–	Ant II and III with a strong spine each, thus modified for clasping	5
4	Ant II and III with several long and thin setae	<i>aspinosa</i> Bretfeld & Trinklein, 2000
–	Ant II and III with all setae rather short and stout	<i>multispina</i> n. sp.
5	Furca with 2+2 strong hooks on posterior side	<i>peruensis</i> n. sp.
–	Furca without such hooks	6
6	Tita III with setae of normal setal shapes, without or with small or strong teeth	7
–	Tita III with some setae modified into thick or forked spines, or striated or thick blades, other setae may have teeth	30
7	VT without special structures, often 1+1 small vesicles occur on posterior side	8
–	VT with special structures on ant, post or lat sides, or on all sides	12
8	Setae of Tita III without teeth, seta IIpe long and thin	
 <i>neopumilis</i> Bretfeld & Gauer, 1994	
–	Tita III setae IIIpi or IVpi or both strong and toothed	9
9	Head frons with 1+1 setae a4	10
–	Head frons without these setae a4	11
10	Head frons with the pair of rows a, b close together, length of Ant II : III = 1.4, mucro with about 10 inner teeth	<i>pilleata</i> Bretfeld & Gauer, 1994
–	Head frons with the pair of rows a, b clearly separated, length of Ant II : III = 2.0, mucro with about 15 inner teeth	<i>clara</i> Bretfeld & Gauer, 1994
11	Ant II with two additional spines, length of Ant II : III = 3.0, femur III with a short and blunt post spine, Tita III seta IIIpi thinner than IVpi, total male 0.16 mm	<i>martii</i> Bretfeld & Gauer, 1994
–	Ant II and femur III without such spines, Ant II : III with other proportion, Tita III seta IIIpi strong with few large teeth, seta IVpi thin with small teeth, total male up to 0.22 mm	<i>robusta</i> Bretfeld & Gauer, 1994
12	(7) VT with a small, broad or round post membrane	13
–	VT without such a membrane	16
13	VT with a large round post membrane	14
–	VT with a small or broad post membrane	15

- 14 This membrane flanked by 2+2 finger like proc, VT also with 1+1 distal, irregular lobes *tropica* n. sp.
- This membrane flanked by 1+1 finger like and 1+1 tridentate lateral proc, VT also with several pairs of ant lobes *mandibulata* Bretfeld & Gauer, 1994
- 15 VT with two small post membranes, the most post one three-lobed, the more ant one a semicircle, VT also with 1+1 small middle points .. *coronata* Bretfeld & Gauer, 1994
- VT with a broad post membrane covering the basis of a broad-forked median proc and of 1+1 finger like proc, VT also with several pairs of lat and distal lobes .
..... *catapulta* Bretfeld & Gauer, 1994
- 16 (12) VT without a median post proc 17
- VT with a median post proc 18
- 17 VT with 1+1 post-lat waved finger like proc, 1+1 lat thick knobs and 1+1 ant vesicles *fibulifera* Bretfeld & Gauer, 1994
- VT with 1+1 post blades with 3 lobes each and 1+1 strong post-lat proc with large doubled teeth *irmleri* Bretfeld & Gauer, 1994
- 18 VT in lat view with a small post semicircle, also with 2+2 bi-dentate lat proc
..... *fluminensis* Arlé, 1984
- VT in lat view without such a small post semicircle 19
- 19 VT besides the median post proc with either blunt lobes, or finger like or pointed lat proc, or both 20
- VT besides the median post proc with 1+1 small, striated blades and 1+1 ant mandible like proc, the inner sides of which with three round teeth, the outer sides with a small pointed hook each *boettgeri* Bretfeld & Gauer, 1994
- 20 VT besides the median post proc with only blunt lobes 21
- VT besides the median post proc with only finger like, pointed or forked proc 23
- = VT besides the median post proc with both blunt lobes and finger like or pointed proc
..... 28
- 21 VT with 2 – 3 pairs of long lat lobes *lobata* Bretfeld & Gauer, 1994
- VT with several pairs of small lobes 22
- 22 VT with 3+3 small post lobes near the median proc and 1+1 small lat lobes, abdomen with two broad, blue cross stripes *bivirgata* Bretfeld, 2002
- VT with several pairs of lobes opposite to the median proc, abdomen and extremities irregular blue *cardosi* Arlé, 1984
- 23 (20) VT with 1+1 proc, either on ant or post side 24
- VT with more than one pair of post proc 29
- 24 VT with 1+1 post proc 25
- VT with 1+1 long ant proc with forked tips *cerastes* Bretfeld & Gauer, 1994

- 25 VT with pointed post proc 26
 – VT with slender post proc with blunt tips 27
- 26 Post proc of VT are short hooks, median post proc thick and blunt
 *pippetti* Murphy, 1966
 – Post proc of VT are forks, apparently on a large, bent membrane with a median knob,
 median post proc is a short knob *carioca* Arlé, 1984
- 27 VT with 1+1 finger like post proc, one tip round, the other cut, median post proc is a
 simple, blunt cone *biclava* Bretfeld & Trinklein, 2000
 – VT with 1+1 waved post proc with earlike inner border each, median post proc is a
 thick rod with fanlike root, 1+1 pointed tips and a strong spine directed towards
 the anterior *franklinae* Bretfeld & Gauer, 1994
- 28 (20) VT with about 5+5 finger like pointed and blunt proc only on post side, median
 post proc deeply forked *decemdigitata* n. sp.
 – VT with one pair of pointed proc on both post and ant sides, also 2+2 lat lobes present
 *chisacae* Bretfeld & Gauer, 1994
- 29 (23) VT with median post proc thick but pointed and with several pointed post proc,
 1+1 long and 1+1 short and forked *vampyra* n. sp.
 – VT on post side with 1+1 finger-like bent proc, the tips of which with several points, and
 1+1 strong, forked and pointed proc, median post proc broad with apical depression
 *panguanae* n. sp.
- 30 (6) Tita III with thick or forked spines 31
 – Tita III with slender or two-parted blades 36
- 31 These spines forked 32
 – These spines not forked 33
- 32 This spine is a long, slender fork, basal part short and blunt, distal part acuminate...
 *aserrata* Mari Mutt, 1987
 – This spine is an extremely thick fork, basal part long and blunt, distal part slender with
 irregular tip *tschirnhausi* n. sp.
- 33 Tita III with one spine 34
 – Tita III with three acuminate spines
 *schalleri* Massoud & Delamare Deboutteville, 1964
- 34 This spine is long 35
 – This spine is rather short and blunt, with middle part depress
 *squamifera* Bretfeld & Gauer, 1994
- 35 This spine is slender on a large papilla *paroara* Arlé, 1984
 – This spine is thick and blunt *winteri* Massoud & Delamare Deboutteville, 1964

36	(30) Tita III with one blade	37
–	Tita III with two blades, VT with asymmetrical proc	38
37	Tita III with a slender blade	39
–	Tita III with a two-parted blade, one part pointed, the other blunt	41
38	VT with 3–5 finger like post proc and several other complicated asymmetrical post proc	<i>sturmi</i> Bretfeld & Gauer, 1994
–	VT with an asymmetrical post membrane and two distal asymmetrical lobes bent from the right to the left	<i>spira</i> Bretfeld & Gauer, 1994
39	Tita III with a blade in form of a rather short sickle	<i>betschi</i> Arlé, 1984
–	Tita III with a long blade	40
40	The tip of this blade is acuminate	<i>torifera</i> n. sp.
–	The tip of this blade is cut.....	<i>heloisae</i> Arlé, 1984
41	(37) Both parts of this blade short, blade on a large papilla	<i>delamerei</i> Bretfeld, 1997
–	This blade not on a large papilla, pointed part longer than the blunt one	<i>denisi</i> Massoud & Delamare Deboutteville, 1964

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