

UNIVERSIDADE ESTADUAL DE SANTA CRUZ DEPARTAMENTO DE CIÊNCIAS BIOLÓGICAS PROGRAMA DE PÓS–GRADUAÇÃO EM ZOOLOGIA



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# CONTRIBUIÇÃO AO CONHECIMENTO TAXONÔMICO DO GÊNERO Pilizetes SELLNICK, 1937 (ORIBATIDA: GALUMNIDAE): REVISÃO BIBLIOGRÁFICA, IDENTIFICAÇÃO E DESCRIÇÃO DE ESPÉCIES NOVAS DA BAHIA

ILHÉUS – BAHIA

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Orientador: Prof. Anibal Ramadan Oliveira

ILHÉUS – BAHIA

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## CONTRIBUIÇÃO AO CONHECIMENTO TAXONÔMICO DO GÊNERO Pilizetes SELLNICK, 1937 (ORIBATIDA: GALUMNIDAE): REVISÃO BIBLIOGRÁFICA, IDENTIFICAÇÃO E DESCRIÇÃO DE ESPÉCIES NOVAS DA BAHIA

#### RESUMO

Ácaros do gênero *Pilizetes* Sellnick, 1937 (Oribatida: Galumnidae) são ácaros de vida livre, os quais vivem nas camadas superficiais do solo e serrapilheira. Atualmente o gênero possui 16 espécies em dois subgêneros, com 14 espécies válidas de distribuição Etiópica (todo o gênero *Pilizetes*) e apenas duas, *Pilizetes (Neopilizetes) neotropicus* (Balogh and Mahunka, 1978) e *Pilizetes (Neopilizetes) rugifrons* (Stoll, 1891) "sp. inq.", de distribuição Neotropical. Nosso objetivo é contribuir ao conhecimento taxonômico de *Pilizetes* na região Neotropical, através de uma revisão de literatura e a descrição de novos taxons da Bahia, Brasil. Espécimes de amostras da interface solo-serrapilheira foram coletadas em uma plantação de cacau no campus da Universidade Estadual de Santa Cruz (UESC), Ilhéus, Bahia, e montados em lâminas ou "stubs" para ilustração ou produção de Micrografias eletrônicas de varredura (SEMs). *Pilizetes (N.) neotropicus* é redescrito. Dois novos subgêneros e quatro novas espécies são descritas: *Pilizetes* (n. subgen.1) n. sp. A, *Pilizetes* (n. subgen.2) n. sp. A e *Pilizetes* (n. subgen.2) n. sp. B. Uma redefinição de *Pilizetes* é proposta para abrigar os novos taxons. Uma chave de identificação para auxiliar a separação dos subgêneros e espécies do mundo é apresentada.

Palavras-chave: ácaros oribatídeos, taxonomia, pilizetoid group, Região Neotropical

# CONTRIBUTION TO THE TAXONOMIC KNOWLEDGE OF THE GENUS *Pilizetes* SELLNICK, 1937 (ORIBATIDA: GALUMNIDAE): LITERATURE REVIEW, IDENTIFICATION AND DESCRIPTION OF NEW SPECIES FROM BAHIA

## ABSTRACT

Mites of the genus *Pilizetes* Sellnick, 1937 (Oribatida: Galumnidae) are free–living mites, which live in the soil and litter surface layers. Currently, the genus has 16 species in two subgenera, with 14 valid species of Ethiopic distribution (all in the subgenus *Pilizetes*) and only two, *Pilizetes* (*Neopilizetes*) *neotropicus* (Balogh and Mahunka, 1978) and *Pilizetes* (*Neopilizetes*) rugifrons (Stoll, 1891) "sp. inq.", of Neotropical distribution. Our objective is to contribute to the taxonomical knowledge of *Pilizetes* in the Neotropical region, through a literature review and the description of new taxa from Bahia, Brazil. Specimens from soil-litter interface samples were collected in a cocoa plantation from the campus of the Universidade Estadual de Santa Cruz (UESC), Ilhéus, Bahia, and mounted in slides or stubs for illustration or Scanning Electronic Micrographs (SEMs). *Pilizetes* (*N.*) *neotropicus* is redescribed. Two new subgenera and four new species are described: *Pilizetes* (n. subgen.1) n. sp. A, *Pilizetes* (n. subgen.1) n. sp. B, *Pilizetes* (n. subgen.2) n. sp. A and *Pilizetes* (n. subgen.2) n. sp. B. A Redefinition of *Pilizetes* is proposed to abrigate the new taxa. An identification key to help in the separation of the subgenera and species of the world is given.

Key-words: oribatid mites, taxonomy, pilizetoid group, Neotropical Region

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## 1 INTRODUÇÃO

Ácaros oribatídeos (Arachnida: Acari), excluindo–se a coorte Astigmatina, constituem um grupo cosmopolita e muito diversificado de pequenos animais, variando entre 0,1 a 3,0 mm (embora a maioria possua entre 0,3 e 0,7 mm de comprimento). Com cerca de 10.000 espécies em cerca de 170 famílias, os ácaros oribatídeos são freqüentemente considerados o grupo de maior dominância de artrópodes nas camadas superficiais do solo e serrapilheira, atingindo de alguns milhares a centenas de milhares de indivíduos por metro quadrado em florestas, pradarias, pastagens e plantios agrícolas em todo o mundo (NORTON; BEHAN– PELLETIER, 2009).

Muitas espécies também podem ser encontradas no caule, ramos e folhas de todos os tipos de plantas, além de musgos, algas, liquens e ambientes aquáticos de água-doce ou marinhos (PÉREZ–IÑIGO, 1993; TRAVÉ et al., 1996; NORTON; BEHAN–PELLETIER, 2009). São ácaros geralmente bem esclerotizados e escuros na fase adulta, motivo pelo qual são denominados vulgarmente como "ácaros besouros" ou "ácaros de armadura" (OLIVEIRA, 2011). Embora cerca de 10.000 espécies de Oribatida tenham sido descritas mundialmente (SUBÍAS 2004 – versão online atualizada 2015), e cerca de 500 registradas no Brasil (OLIVEIRA, 2004), pouco se conhece ainda sobre a ocorrência desses ácaros no Estado da Bahia.

Ácaros oribatídeos alimentam–se principalmente de fungos e vegetais em decomposição (TRAVÉ et al., 1996; MORAES; FLECHTMANN, 2008; OLIVEIRA, 2011), atuando nas cadeias alimentares decompositoras da serrapilheira através da fragmentação dos resíduos vegetais dos quais se alimentam, acelerando a ciclagem da matéria orgânica vegetal, exercida pela ação decompositora de fungos e bactérias (TRAVÉ et al., 1996; VÁZQUEZ; TRUEBA, 2001). A maior parte espécies de ácaros oribatídeos do Brasil foi registrada em ambientes de solo e serrapilheira (OLIVEIRA, 2004).

A família Galumnidae Jacot, 1925 é uma das mais diversificadas dentre os Oribatida, com 33 gêneros e 499 espécies (SUBÍAS 2004 – versão online atualizada 2015). Os ácaros do gênero *Pilizetes* Sellnick, 1937 (Oribatida: Galumnidae) são galumnídeos de vida livre, que habitam as camadas superficiais do solo e serrapilheira, de tamanho médio (0,3 a 0,7 milímetros), arredondados, bem pigmentados e esclerotizados, caracterizados pela presença de setas notogastrais bem desenvolvidas e adornos no notogaster e pteromorfas (BALOGH; BALOGH, 1992, 2002). Embora sua biologia e ecologia sejam desconhecidas, é provável

que, como outros Galumnidae, se alimentem principalmente de fungos e/ou material vegetal em decomposição (OLIVEIRA, 2010).

Atualmente, o gênero *Pilizetes* é dividido em dois subgêneros: *Pilizetes* (*Pilizetes*), de distribuição Etiópica, com 14 espécies válidas, e *Pilizetes* (*Neopilizetes*), de distribuição Neotropical, com duas espécies válida, *Pilizetes* (*N.*) *neotropicus* Balogh & Mahunka, 1978 e *Pilizetes* (*Neopilizetes*) *rugifrons* (Stoll, 1891) "sp. inq." (SUBÍAS 2004 – versão online atualizada 2015). Apesar da diversidade de espécies de *Pilizetes* (*Pilizetes*) ser maior na região Etiópica, quatro espécies não identificadas, em dois prováveis subgêneros novos próximos a *Pilizetes* (*Neopilizetes*), têm sido encontradas em amostras coletadas em cacauais da Região Sul da Bahia.

O objective geral desse trabalho será o de contribuir para o conhecimento da diversidade dos *Pilizetes* Neotropicais, através da redescrição de *Pilizetes* (*Neopilizetes*) *neotropicus* Balogh & Mahunka, 1978, e da descrição de dois novos subgêneros, com duas espécies cada, coletados de amostras de solo–serrapilheira em Ilhéus, BA. Uma chave de identificação para auxiliar na separação das espécies de *Pilizetes* do mundo é apresentada.

## 2 REVISÃO DA LITERATURA

O gênero *Pilizetes* (Oribatida: Galumnidae) foi descrito da Tanzânia por Sellnick (1937) para abrigar uma única espécie, *Pilizetes africanus* Sellnick, 1937, com superfície do corpo foveolada, setas notogastrais presentes e áreas porosas ausentes.

Mais de 20 anos depois, Balogh (1958) descreveu mais duas espécies do gênero: *Pilizetes basilewskyi*, da Tanzânia, e *Pilizetes sellnicki*, de Angola. O mesmo autor descreveu *Pilizetes curtipilus* do Congo (BALOGH, 1960) e *Pilizetes subglaber* da Tanzânia (BALOGH, 1962). No mesmo ano, Balogh (1966) e Balogh e Mahunka (1966) descreveram *Pilizetes dudichi* do Tchad e *Pilizetes australis* da África do Sul, respectivamente.

A partir do final dos anos 60, Sandor Mahunka passou a assumir a liderança em publicações de espécies novas de *Pilizetes*, descrevendo *Pilizetes saskai* da Tanzânia (MAHUNKA, 1969) e *Pilizetes neotropicus* do Brasil (BALOGH; MAHUNKA, 1978), primeira espécie *Pilizetes* a ser descrita fora da região Etiópica. Nos anos 80, Mahunka descreveu três espécies novas da Tanzânia, *Pilizetes csoengeyi* (MAHUNKA, 1983), *Pilizetes brevisetus* e *Pilizetes subsimilis* (MAHUNKA, 1984), além de *Pilizetes denticulatus* do Quênia (MAHUNKA, 1986). A última espécie nova de *Pilizetes* descrita por Mahunka foi *Pilizetes tuberculatus*, das Ilhas Comores (MAHUNKA, 1994).

A mais recente espécie descrita de *Pilizetes* foi *Pilizetes anufrievi* da Etiópia (ERMILOV et al., 2010).

Balogh e Balogh (1990) criaram o gênero *Neopilizetes* para abrigar *Pilizetes neotropicus* Balogh & Mahunka, 1978, a única espécie do gênero encontrada fora da região Etiópica, tendo como espécie tipo *Neopilizetes neotropicus* (Balogh & Mahunka, 1978). As seguintes características distintivas do novo gênero foram apresentadas: (1) linhas lamelar (L) e sublamelar (S) presentes, paralelas, (2) setas lamelares inseridas entre as linhas  $L \in L$ , (3) setas notogastrais presentes, (4) um par de áreas porosas (A1) presentes e (5) prodorso e notogaster com linhas longitudinais.

O gênero *Neopilizetes*, incluído na subfamília Pergalumninae [galumnídeos com setas lamelares (*le*) originadas entre as linhas *L*], foi diferenciado de *Pilizetes* em uma chave para gêneros galumnóides apresentada por Balogh e Balogh (1992) através das seguintes características distintivas em *Neopilizetes*: sutura dorsosejugal presente (ausente em *Pilizetes*) e prodorso e notogaster com linhas longitudinais (notogaster foveolado, excepcionalmente pontuado, em *Pilizetes*).

Balogh e Balogh (2002) propuseram um grupo operacional (sem nível taxonômico ou diagnose formais) denominado "Pilizetoid group" para abrigar os galumnídeos da subfamília Pergalumninae com setas notogastrais presentes. Neste mesmo trabalho, foi apresentado um novo caráter para diferenciação entre *Neopilizetes* e *Pilizetes*, a presença de setas *ad3* próximas da abertura anal (distante nos *Pilizetes*).

Subías (2004 – versão online atualizada 2015), apresentou uma lista sistemática e biogeográfica das espécies de *Pilizetes* do mundo, incluindo 16 especies em dois subgêneros, *Pilizetes* (*Pilizetes*) Sellnick, 1937, com 14 especies da região Etiópica e *Pilizetes* (*Neopilizetes*) J. & P. Balogh, 1990 (=?*Kratzensteinia* Oudemans, 1919 "gen. inq."), com apenas duas espécies da região Neotropical, *Pilizetes* (*Neopilizetes*) *neotropicus* Balogh & Mahunka, 1978 e *Pilizetes* (*Neopilizetes*) *rugifrons* (Stoll, 1891) "sp. inq.", originalmente descrita como *Oribata* da America Central.

## 3 ARTIGO FORMATADO PARA SUBMISSÃO À ZOOTAXA

The genus *Pilizetes* Sellnick, 1937 (Oribatida: Galumnidae): redescription of *Pilizetes* (*Neopilizetes*) *neotropicus* (Balogh and Mahunka, 1978), description of new taxa from Neotropics and identification key to world species

### Abstract

Based on the systematic list of Subías, 2004 (online update 2015), 14 valid species of *Pilizetes* Sellnick, 1937 (Oribatida: Galumnidae) are of Ethiopic distribution (all in the subgenus *Pilizetes*) and only two, *Pilizetes* (*Neopilizetes*) *neotropicus* (Balogh and Mahunka, 1978) and *Pilizetes* (*Neopilizetes*) *rugifrons* (Stoll, 1891) "sp. inq.", are of Neotropical distribution. Our objective is to contribute to the taxonomical knowledge of *Pilizetes* in the Neotropical region. Specimens from soil–litter interface samples were collected in a cocoa plantation from the campus of the Universidade Estadual de Santa Cruz (UESC), Ilhéus, Bahia, Brazil. *Pilizetes* (*N.*) *neotropicus* is redescribed. Two new subgenera and four new species are described: *Pilizetes* (n. subgen.1) n. sp. A, *Pilizetes* (n. subgen.1) n. sp. B, *Pilizetes* (n. subgen.2) n. sp. A and *Pilizetes* (n. subgen.2) n. sp. B. A Redefinition of *Pilizetes* is proposed to abrigate the new taxa, and an identification key to the subgenera and species of the world is given.

Key words: oribatid mites, taxonomy, pilizetoid group, Neotropical Region

## Introduction

The genus *Pilizetes* (Oribatida: Galumnidae) was described from Tanzania by Sellnick (1937) to accommodate a single species, *Pilizetes africanus* Sellnick, 1937, with foveolate body surface, notogastral setae present, and porose areae absent. Balogh (1958) described *Pilizetes basilewskyi* from Tanzania, and *Pilizetes sellnicki* from Angola. The same author described *Pilizetes curtipilus* from Congo (Balogh 1960) and *Pilizetes subglaber* from Tanzania (Balogh 1962). Balogh (1966) and Balogh and Mahunka (1966) described *Pilizetes dudichi* from Tchad and *Pilizetes australis* from South Africa, respectively. After Mahunka's first contribution on the taxonomy of *Pilizetes*, this author took the lead in publications on the genus, describing *Pilizetes saskai* from Tanzania (Mahunka 1969) and *Pilizetes neotropicus* from Brazil (Balogh and Mahunka 1978), the only species of *Pilizetes described outside* the Ethiopic Region. The same author described *Pilizetes csoengeyi* (Mahunka, 1983), *Pilizetes brevisetus* and *Pilizetes subsimilis* (Mahunka 1984) from Tanzania, *Pilizetes denticulatus* from Kenya (Mahunka, 1986) and *Pilizetes tuberculatus* from Comores Island (Mahunka 1994). The last know species *Pilizetes anufrievi*, was described from Ethiopia (Ermilov *et al.* 2010).

The monotypic genus *Neopilizetes* was proposed by Balogh and Balogh (1990) to accommodate *P. neotropicus*, the only *Pilizetes* species described from Neotropical Region, giving the following distinctive features for the new genus: lamellar (L) and sublamellar (S) lines present, parallel, lamellar setae originated between L and L, notogastral setae present, one pair of area porosae (AI) present, prodorsum and notogaster with longitudinal lines. *Neopilizetes* was differentiated from *Pilizetes* in the key to galumnoid genera presented by Balogh and Balogh (1992) by the following distinctive features in *Neopilizetes*: dorsosejugal suture (furrow) present (absent in *Pilizetes*) and prodorsum and notogaster with longitudinal

lines (notogaster foveolate, exceptionally punctuate, in *Pilizetes*). Balogh and Balogh (2002) presented a new character to differentiate *Neopilizetes* and *Pilizetes*, the presence of *ad3* setae near the anal aperture (far in *Pilizetes*), including both genera in a "Pilizetoid group" of Pergalumninae.

Subías (2004 – update online 2015) presented a systematic and biogeographic list of the *Pilizetes* species of the world including 16 species in two subgenera, *Pilizetes* (*Pilizetes*) Sellnick, 1937, with 14 Ethiopic species, and *Pilizetes* (*Neopilizetes*) J. & P. Balogh, 1990 (=?*Kratzensteinia* Oudemans, 1919 "gen. inq."), with only two Neotropical species, *Pilizetes* (*Neopilizetes*) *neotropicus* Balogh & Mahunka, 1978 and *Pilizetes* (*Neopilizetes*) *rugifrons* (Stoll, 1891) "sp. inq.", originally described as *Oribata* from Central America.

The objective of this paper is to contribute to the knowledge of the Neotropical *Pilizetes* diversity, through the redescription of *Pilizetes* (*Neopilizetes*) *neotropicus* Balogh & Mahunka, 1978, and the description of two new *Pilizetes* subgenera, with two new species each, collected from soil–litter samples in Ilhéus, Bahia, Brazil. An identification key to help in the separation for the world *Pilizetes* species is provided.

#### **Materials and methods**

Soil–litter interface samples were collected in a cacao plantation from the campus of the Universidade Estadual de Santa Cruz (UESC), in the municipality of Ilhéus, Bahia, Northeastern Brazil, in 10–I–2008, 13–VIII–2013 and 22–III–2015. Adult specimens were extracted from samples using a modified Berlese–Tullgren apparatus and preserved in 70% ethanol. Part of the specimens was dehydrated with absolute alcohol, mounted on stubs, metalized and examined on a scanning electron microscope for production of SEMs. The other part was clarified using a mixture of Nesbit + Hoyer's medium (1:1) during eight to ten

hours and mounted in slides in Hoyer's. Entire specimens were mounted in cavity–slides and dissected specimens were mounted in regular slides for exam under a compound microscope. Line drawings were made with the aid of a camera lucida and finished with Adobe Illustrator CS6 Series<sup>®</sup>. Both SEMs and illustrations were considered for description and measurements. Body length was measured in dorsal view, from the tip of the rostrum to the posterior edge of the notogaster. Notogastral width refers to the maximum width in dorsal view. Setal formulae are given in numbers per segment from trochanter to tarsus. Most terminology and abbreviations follow F. Grandjean (see Travé & Vachon, 1975, for references and Norton & Behan–Pelletier, 2009, for overview). The classification of *Pilizetes* in subgenera adopted in this work is that of Subías (2004 – update online 2015).

## Taxonomy

Family: Galumnidae Jacot, 1925
Genus: *Pilizetes* Sellnick, 1937
Subgenus: *Pilizetes* (*Neopilizetes*) J. & P. Balogh, 1990

### Pilizetes (Neopilizetes) neotropicus Balogh & Mahunka, 1978

(Figs. 1-4, Table 1)

**Diagnosis.** Prodorsum longitudinally covered with low crests (fine striae/lines); lamellar (L) and sublamellar (S) lines present, parallel, lamellar seta (le) originated between L and L; dorsumsejugal furrow (suture) present; notogaster with a central, longitudinal depression in the anterior half, longitudinally covered with low crests (fine striae/lines); pteromorph radially

striate; three pairs of small porose areae (Aa, A1 and A3) present; ten pairs of well developed and rigid notogastral setae, with setae c2 on pteromorph; seta 3b longer than other epimeral setae; 6-1-2-3 pairs of genital, aggenital, anal and adanal setae, respectively; genital and anal aperture not covered with cerotegument; anal aperture finely striate; seta ad3 near to anal aperture, the distance shorter than half width of anal aperture; trägardh's organ (trg) pointing up.

**Dimensions.** Body length (n=5)  $308-408\mu$ m and width  $297-312\mu$ m. Sexual species, with males common (sex ratio not determined).

**Prodorsum.** Moderately covered with cerotegument. With longitudinal low crests from the rostral (*ro*) setae level till the interlamellar (*in*) setae level, interrupted by a transversal flaw closer to the *in* setae (Figs. 1 A, F, 2 A, E, F). Rostrum forming an elongated, rounded naso (Figs. 1 F, 2 E, F). The *ro* setae are thin, directed medially, with about 3/4 of the distance between their bases in length (Figs. 1 F, 2 F). The lamellar (*le*) setae are thin, directed medially, with less than 1/6 of the distance between their bases in length (Figs. 1 F, 2 E, F). The *in* setae are thick, barbed, directed medially, with about 1/4 of the distance between their bases in length (Figs. 1 A, C, F, 2 E). Setae *ro*, *le* and *in* of similar lengths, ~20µm. Lamellae and tutorium absent, reduced to two narrow dorsolateral ridges, the lines *L* and S, respectively (Fig. 1 F). Lamellar setae originate mediad to line *L*. Bothridial opening lateral, cup shaped (Fig. 1 A). Sensillus (bothridial seta, *ss*) thick, sharp–tipped, with two parallel series of barbs occupying almost its entire exposed length, ~100µm (Figs. 1 B, 2 D). Dorsumsejugal furrow present (Figs. 1 A, 2 A).

**Notogaster.** Moderately covered with cerotegument. Circular to pentagonal in shape in dorsal view, with large, hinged, auriculate pteromorph (Figs. 1 A, 2 A). Notogaster with a central, longitudinal depression in the anterior half (Fig. 2 E), covered with low and long longitudinal crests, pteromorph covered with low radial crests (Figs. 1 A, 2 A, B, C, D). Ten pairs of well developed, smooth and rigid notogastral setae (c2, la, lm, lp, h1, h2, h3, p1, p2and p3), ~10µm. Five pairs of notogastral lyrifissures (ia on pteromorph and im, ih, ip and ipson notogaster – just im observed in dorsal view), ia and im with about the same length and larger than others. Opisthonotal gland (gla) located between the p3 and h3 setae. Porose area Aa, A1 and A3 present, small. Medial pore (mp) absent (Fig. 1 A, 2 C).

**Ventral region.** Moderately covered with cerotegument. Epimeral setation 2–0–1–2. Setae *1b*, *4a* and *4b* rigid, smooth, acuminate and short, ~5µm. Setae *3b* filliform, flexible, long and smooth, ~19µm. Setae *1c* represented only by alveoli (Figs. 1 E, 4 D, E). The distance between the genital and anal plates about the same length of the genital plate (Figs. 1 E, 4 C). Genital aperture not covered with cerotegument, smooth, subquadrate, slightly wider anteriorly, with six pairs of setae. Setae *g1* and *g2* inserted on the anterior margin of the genital valves, ~10 and ~5µm, respectively. Setae *g3*, *g4* and *g5* aligned in the middle of the genital valves and *g6* next the posterior margin, similar in morphology and length to epimeral setae, ~5µm (Figs. 1 E, 4 D). Setae *ag* near the genital aperture, smooth and acuminate, similar to the epimeral setae in shape, ~5µm. Anal aperture subcircular/pentagonal, not covered with cerotegument, finely striate, larger than the genital aperture, wider posteriorly, with two pairs of smooth setae *an2* and *an3*, ~9µm. Setae *ad1*, *ad2* and *ad3* near the anal aperture, smooth and acuminate, ~5µm. Lyrifissure *iad* parallel to the lateral margin of the anal aperture (Figs. 1 E, 4 F). Postanal porose area (*ap*) absent.

**Gnathosoma.** Sucapitulum cuticle densely punctuated, diarthric type, with mental tectum. Two pairs of *or* setae, ~ 7µm. Setae *a* and *m* long, ~16 and 11µm respectively. Setae *h* short, ~5µm (Fig. 1 D). Palp setal formula from trochanter to tarsus 0-2-1-3-9, plus solenidium  $\omega$ . Palpal eupathidium *acm* attached to solenidium  $\omega$  (double horn) and projecting from a small protrusion (Fig. 3 B). Chelicerae of usual robust form (chelate–dentate), densely punctuated between the *en* line and the basis of the movable digit. Setae *cha* and *chb* long and

barbed, ~47 and 32μm, respectively. Trägardh's organ (*trg*) slightly pointing up, ~28μm (Fig. 3 D).

**Legs.** Well sclerotized, not covered with cerotegument. Most articles smooth, except trochanter III–IV and femur I–IV, which are striated. All pretarsi tridactylous, with lateral claws thinner than the empodium (Fig. 3 A, C, E, F). Setal formulae (legs I–IV): trochanter 1–1–1–1, femur 4–4–2–2, genu 3–3–1–2, tibia 4–4–3–3 and tarsus 20–15–15–12 (Table 1). Leg I famulus (*e*) short, ~6 $\mu$ m, with expanded tip (Figs. 3 G). Lyrifissure *ly* in the basis of tarsus, near to arthrodial membrane, observed in the antiaxial aspect. Solenidia number, form and distribution as shown in Table 1.

**Material Examined:** Holotype (336–HO–77), kindly loaned by the Hungarian Natural History Museum. 12 specimens (dissected and mounted in slides) and 18 specimens (mounted on a stub for SEM) collected from soil–litter interface samples in a cacao plantation from the campus of the Universidade Estadual de Santa Cruz (UESC), Ilhéus, Bahia, in 10–I–2008 and 13–VIII–2013 by Anibal R. Oliveira.



**FIGURE 1.** *Pilizetes* (*N*.) *neotropicus*: A) dorsal view; B) *ss*, sensillus; C) *in*, interlamellar setae; D) subcapitulum; E) ventral view; F) prodorsum frontal view.



**FIGURE 2.** *Pilizetes* (*N*.) *neotropicus*: A) dorsal view; B) lateral view; C) dorsal setae detail and *gla*, opisthonotal gland; D) *ss*, sensillus; E) prodorsum frontal view; F) prodorsum detail presenting *le* and *ro* setae.



**FIGURE 3.** *Pilizetes* (*N*.) *neotropicus*: A) leg I antiaxial view; B) palp antiaxial view; C) leg II antiaxial view; D) chelicerae antiaxial view; E) leg III antiaxial view; F) leg IV antiaxial view; G) seta *e* (famulus) detail.



**FIGURE 4.** *Pilizetes* (*N*.) *neotropicus*: A) *in*, interlamellar setae detail; B) anal view; C) ventral view; D) genital aperture; E) 3b setae detail; F) anal aperture.

### *Pilizetes* (n. subgen.1)

(Figs. 5–14, Table 1)

### Type species: Pilizetes (n. subgen.1) n. sp. A

**Diagnosis.** Prodorsum covered with long longitudinal crests, the top of each crest flattened and slightly lower than the laterals in transversal view; naso rounded in frontal view; lamellar (*L*) and sublamellar (*S*) lines present, parallel, lamellar seta (*le*) originated between *L* and *L*; dorsumsejugal furrow (suture) present; notogaster covered with crests, with most of the lateral crests originating from the central crests of the notogaster; pteromorph covered with crests, largely tending to follow the curvature of the pteromorph near its margin; two pairs of well developed porose areae (*A1* and *A2*), forming four posterior protuberances on notogaster; ten pairs of well developed and rigid notogastral setae, with setae *c2* on pteromorph and *p1* on two terminal protuberances; 6-1-2-3 pairs of genital, aggenital, anal and adanal setae, respectively; seta *ad3* near to anal aperture, the distance shorter than half width of anal aperture; genital and anal aperture not covered with cerotegument, smooth; Trägardh's organ (*trg*) parallel to the axis of chelicerae.

**Remarks.** In relation to the two other subgenera of *Pilizetes*, *P.* (*Pilizetes*) and *P.* (*Neopilizetes*), *Pilizetes* (n. subgen.1) is closer to *P.* (*Neopilizetes*) by the (1) surface of prodorsum, notogaster and pteromorph covered with crests [foveolate, polygonate or punctate in *P.* (*Pilizetes*)], (2) dorsumsejugal furrow (suture) present [absent in *P.* (*Pilizetes*)] and (3) seta *ad3* near the anal aperture [far from anal aperture in *P.* (*Pilizetes*)]. On the other hand, *Pilizetes* (n. subgen.1) differs from *P.* (*Neopilizetes*) by the (1) shape of the crests in the prodorsum, with the top of each crest flattened and slightly lower than the laterals in transversal view [top of crests not flattened in *P.* (*Neopilizetes*)], (2) notogaster covered with

crests in different orientations, with most of the lateral crests originating from the central region of the notogaster, not from the dorsumsejugal furrow [longitudinal crests originating mostly from the dorsumsejugal furrow in *P.* (*Neopilizetes*)], (3) two pairs of well developed porose areae (*A1* and *A2*), forming four posterior protuberances on notogaster [three pairs of small porose areae (*Aa*, *A1* and *A3*) present, not forming protuberances on notogaster in *P.* (*Neopilizetes*)] and (4) setae *p1* on two terminal protuberances [setae *p1* not set in two terminal protuberances in *P.* (*Neopilizetes*)].

### Pilizetes (n. subgen.1) n. sp. A

(Figs. 5–9)

**Diagnosis**. As for the new subgenus above, with the addition of the following characters: anterior half of the notogastral surface with a deep central, longitudinal depression, formed by two separated central crests. With 4–6 lateral, transversal crests originating from the central crests and forming a 'human thorax–like' pattern in dorsal view; lateral crests absent in the posterior half of the notogaster; posterolateral notogastral margin angularly bent ventrally; lyrifissures *ih*, *im* and *ips* positioned in the dorsal, flat surface of the notogastral; porose areae A1 and A2 forming four large posterior protuberances covered with a thick layer of cerotegument on notogaster; setae p1 on two large terminal protuberances; seta 3b similar in length to the other epimeral setae.

**Dimensions.** Body length (n=7)  $338-383\mu$ m and width  $256-291\mu$ m. Sexual species, with males common (sex ratio not determined).

**Prodorsum.** Moderately covered with cerotegument. With longitudinal cuticle crests, the top of each crest flattened and slightly lower than the laterals in transversal view, from the rostral (*ro*) setae level till the interlamellar (*in*) setae level, interrupted by a transversal flaw

closer to the *in* setae (Figs. 5 A, F, G, 6 D, E, F). Laterals of the prodorsum reticulated (Figs. 5 G, 6 D, E, F). Rostrum forming an elongated naso between *ro* setae (Figs. 5 G, 6 D). The *ro* setae are thin, with few barbs barely visible, directed medially, with about 3/4 of the distance between their bases in length (Figs. 5 A, D, G, 6 D, E, 7 B). The lamellar (*le*) setae are thin and smooth, directed medially, with about 1/4 of the distance between their bases in length (Figs. 5 A, D, G, 6 D, E, 7 B). The lamellar (*le*) setae are thin (Figs. 5 A, G, 6 D). The *in* setae are thick, barbed, directed medially, with about 1/4 of the distance between their bases in length (Figs. 5 A, C, G, 6 D, F). Setae *ro*, *le* and *in* of similar lengths, ~22µm. Lamellae and tutorium absent, reduced to two narrow dorsolateral ridges, the lines *L* and S, respectively (Fig. 5 G, 6 D, 7 B). Lamellar setae originate mediad to line *L*. Bothridial opening lateral, cup shaped (Fig. 5 A). Sensillus (bothridial seta, *ss*) thick, sharp–tipped, with two parallel series of barbs occupying almost its entire exposed length, ~120µm (Figs. 5 A, B, 6 A). Dorsumsejugal furrow present (Figs. 5 A, 6 A, D).

**Notogaster.** Densely covered with cerotegument. Circular to pentagonal in shape in dorsal view, with large, hinged, auriculate pteromorph, and a deep arch–like posterior depression formed by two terminal protuberances (Figs. 5 A, 6 A). Posterolateral margins of notogaster flat, angularly bent ventrally, abruptly folding toward the ventral plate (Fig. 7 A). Anterior half of the notogastral surface with a central, longitudinal depression, with 4–6 lateral, transversal crests, most of them originating from it (not from the dorsumsejugal furrow) and forming a human 'thorax–like' pattern in dorsal view. Posterior half of the notogaster flat, without transversal crests but with fine striae laterally (Figs. 6 A, B, C). Pteromorph covered with crests, largely tending to follow the curvature of the pteromorph near its margin (5 A, 6 D, 7 A, B). Ten pairs of well developed and rigid notogastral setae (c2, la, lm, lp, h1, h2, h3, p1, p2 and p3), most of them similar in shape to the *in* setae. Setae c2 smooth, on pteromorph, ~10µm. Setae la, lm, lp, h1, h2 and h3 finely barbed, ~17, 20, 15, 13, 16 and 15µm, respectively. Setae p1, p2 and p3 smooth, ~8, 11 and 9µm, respectively, with

setae p1 on two large terminal protuberances (Figs. 5 A, 6 A, B C). Five pairs of notogastral lyrifissures (*ia* on pteromorph and *im*, *ih*, *ip* and *ips* on notogaster – *ih*, *im* and *ips* observed in dorsal view and *ip* observed in lateral view), *ia* and *im* larger than others (Fig. 5 A). Opisthonotal gland (*gla*) located between the lyrifissures *ih*, *im*, *ips*, in the region of the *p3* and *h3* setae (Fig. 5 A). Porose area *A1* and *A2* present, forming four large posterior protuberances covered with a thick layer of cerotegument. Medial pore (*mp*) absent (Fig. 5 A, 6 A, B, C).

**Ventral region.** Moderately covered with cerotegument. Epimeral setation 2–0(1)–1– 2. Setae *1b*, *2a*, *3b*, *4a* and *4b* rigid, smooth, acuminate and short, ~4µm. Setae *2a* absent in most specimens. Setae *1c* represented only by alveoli (Figs. 5 H, 7 D, E). The distance between the genital and anal plates varies from about half to slightly shorter than the length of the genital plate, independently of the sex (Figs 5 H, 7 C). Genital aperture not covered with cerotegument, smooth, subquadrate, slightly wider anteriorly, with six pairs of setae. Setae *g1* and *g2* inserted on the anterior margin of the genital valves, ~10µm. Setae *g3*, *g4*, *g5* and *g6* aligned in the middle of the genital valves, similar in morphology and length to epimeral setae, ~4µm (5 H, 7 E). Setae *ag* proximately in the middle of the distance between the anal and genital apertures, smooth and acuminate, similar to the epimeral setae in shape, ~4µm. Anal aperture not covered with cerotegument, smooth, subcircular/pentagonal, larger than the genital aperture, slightly wider posteriorly, with two pairs of smooth setae *an2* and *an3*, ~3µm. Setae *ad1*, *ad2* and *ad3* near the anal aperture, smooth and acuminate, ~3µm. Lyrifissure *iad* parallel to the lateral margin of the anal aperture (Figs. 5 H, 7 F). Postanal porose areae (*ap*) absent.

**Gnathosoma.** Sucapitulum cuticle densely punctuated, diarthric type, with mental tectum. Two pairs of *or* setae, ~ 7 $\mu$ m. Setae *a* long, ~14 $\mu$ m, with more than twice the length of setae *h* and *m*, ~6 $\mu$ m (Figs. 5 E, 7 C, D). Palp setal formula from trochanter to tarsus 0–2–

1–3–9, plus solenidium  $\omega$ . Palpal eupathidium *acm* attached to solenidium  $\omega$  (double horn) and projecting from a small protrusion (Fig. 8 E, 9 A, B). Chelicerae of usual robust form (chelate–dentate), densely punctuated between the *en* line and the basis of the movable digit. Setae *cha* and *chb* long and barbed, ~36 and 26µm, respectively. Trägardh's organ (*trg*) parallel to the axis of chelicerae, ~35µm (Fig. 8 B, 9 A).

**Legs.** Well sclerotized, not covered with cerotegument. Most articles smooth, except trochanter III–IV and femur I–IV, which are punctuated/striated. All pretarsi tridactylous, with lateral claws thinner than the empodium (Fig. 8 A, C, D, F, 9 C, D, F). Setal formulae (legs I–IV): trochanter 1–1–1–1, femur 4–4–2–2, genu 3–3–1–2, tibia 4–4–3–3 and tarsus 20– 15–15–12 (Table 1). Leg I famulus (*e*) short, ~6 $\mu$ m, with expanded tip (Fig. 9 E). Lyrifissure *ly* in the basis of tarsus, near to arthrodial membrane, observed in the antiaxial aspect. Solenidia number, form and distribution as shown in Table 1.

**Material Examined.** Holotype (male), 21 paratypes mounted in slides (9 entire and 12 dissected), 15 paratypes mounted on a stub for SEM and 50 paratypes preserved in 70% alcohol, collected from soil–litter interface samples in a cacao plantation from the campus of the Universidade Estadual de Santa Cruz (UESC), Ilhéus, Bahia, in 10–I–2008 and 13–VIII–2013 by Anibal R. Oliveira. The holotype and 30 paratypes will be deposited in the UESC Acarology Collection and 20 paratypes will be deposited in the Acarology Collection of Escola Superior de Agricultura "Luiz de Queiroz" (ESALQ), Universidade de São Paulo (USP), Piracicaba, SP, Brazil.

Pilizetes (n. subgen.1) n. sp. B

(Figs. 10-14)

**Diagnosis.** As for the new subgenus above, with the addition of the following characters: notogastral surface entirely covered with crests, with most of the lateral crests in the anterior half of the notogaster originating from two longitudinal, approximated central crests; lateral crests in the posterior half of the notogaster also originating from the central crests; posterolateral notogastral margin bent ventrally; lyrifissures *ih*, *im* and *ips* positioned in the dorsolateral, curve surface of notogaster; porose areae AI and A2 forming four small posterior protuberances covered with a thin layer of cerotegument on notogaster; setae pI on two small terminal protuberances; seta 3b about three times longer than the other epimeral setae.

**Dimensions.** Body length (n=11) 300–350µm and width 229–274. Sexual species, with males common (sex ratio not determined).

**Prodorsum.** Moderately covered with cerotegument. With longitudinal cuticle crests, the top of each crest flattened and slightly lower than the laterals in transversal view, from the rostral (*ro*) setae level till the interlamellar (*in*) setae level, interrupted by a transversal flaw closer to the *in* setae (Figs. 10 A, F, G, 11 E, F). Laterals of the prodorsum reticulated (Figs. 10 G, 11 F, 12 B). Rostrum forming an elongated naso between *ro* setae (Figs. 10 G, 11 E, F). The *ro* setae are thin, with few barbs barely visible, directed medially, with about 3/4 of the distance between their bases in length (Figs. 10 A, D, G, 11 F, 12 B). The lamellar (*le*) setae are thin and smooth, directed medially, with about 1/4 of the distance between their bases in length (Figs. 10 A, G, 11 F, 12 B). The *in* setae are thin and smooth, directed medially, with about 1/4 of the distance between their bases in length (Figs. 10 A, G, 11 F, 12 B). The *in* setae are thin and smooth, directed medially, with about 1/4 of the distance between their bases in length (Figs. 10 A, G, 11 F, 12 B). The *in* setae are thin and smooth, directed medially, with about 1/8 of the distance between their bases in length, shorter than setae *ro* and *le*, ~11µm (Figs. 10 A, G, 11 E). Setae *ro* and *le* of similar lengths, ~22µm. Lamellae and tutorium absent, reduced to two narrow dorsolateral ridges, the lines *L* and S, respectively (Figs. 11 F, 12 B). Lamellar setae originate mediad to line *L*. Bothridial opening lateral, cup shaped (Fig. 10 A). Sensillus (bothridial seta, *ss*) thick, sharp–tipped, with two parallel series of barbs

occupying almost its entire exposed length, ~110μm (Figs. 10 C, 14 C). Dorsumsejugal furrow present (Figs. 10 A, 11 A).

Notogaster. Densely covered with cerotegument. Circular in shape in dorsal view, with large, hinged, auriculate pteromorph, and a small arch-like posterior depression formed by two terminal protuberances (Figs. 10 A, 11 A, C), Posterolateral margins of notogaster curve, bent ventrally, folding toward the ventral plate (Figs. 11 B, C, 12 A). Notogastral surface entirely covered with crests, with most of the lateral crests in the anterior half of the notogaster originating from two longitudinal, approximated central crests; lateral crests in the posterior half of the notogaster also originating from the central crests (Figs. 10 A, 11 A). Pteromorph covered with crests, largely tending to follow the curvature of the pteromorph near its margin (Figs. 10 A, 11 B, 12 A). Ten pairs of well developed, rigid and smooth notogastral setae (c2, la, lm, lp, h1, h2, h3, p1, p2 and p3), most of them similar in size to the *in* setae. Setae c2 smooth, on pteromorph, ~9 $\mu$ m. Setae la, lm, lp, h1, h2 and h3 ~ 9 $\mu$ m. Setae p1, p2 and p3 ~8µm, with setae p1 on two small terminal protuberances (Figs. 10 A, 11 B, C). Five pairs of notogastral lyrifissures. (ia on pteromorph and im, ih, ip and ips on notogaster, observed in dorsolateral view), ia and im larger than others (Fig. 10 A). Opisthonotal gland (gla) located between the lyrifissures *ih*, *im*, *ips*, in the region of the p3 and h3 setae (Fig. 10) A). Porose area A1 and A2 present, forming four small posterior protuberances covered a thin layer of cerotegument. Medial pore (mp) absent (Figs. 10 A, 11 A, B, C).

**Ventral region.** Moderately covered with cerotegument. Epimeral setation 2–0–1–2. Setae *1b*, *4a* and *4b* rigid, smooth, acuminate and short, ~4µm. Seta *3b* reaching about three times the length of the other epimeral setae, ~13µm. Setae *1c* represented only by alveoli (Figs. 10 E, 12 E). The distance between the genital and anal plates about 2/3 of the length of the genital plate (Fig. 10 E, 12 C). Genital aperture not covered with cerotegument, smooth, subquadrate, slightly wider anteriorly, with six pairs of setae. Setae *g1* and *g2*, inserted on the anterior margin of the genital valves, ~ 11µm. Setae g3, g4, g5 and g6 aligned in the middle of the genital valves, similar in morphology and length to epimeral setae (except 3b), ~4µm (Figs. 10 E, 12 E). Setae ag proximately in the middle of the distance between the anal and genital apertures, smooth and acuminate, similar to the epimeral setae in shape, ~4µm (Figs. 10 E, 12 F). Anal aperture not covered with cerotegument, smooth, subcircular/pentagonal, larger than the genital aperture, slightly wider posteriorly, with two pairs of smooth setae an2and an3, ~4µm. Setae ad1, ad2 and ad3 near the anal aperture, smooth and acuminate, ~4µm. Lyrifissure *iad* parallel to the lateral margin of the anal aperture (Fig. 10 E, 12 F). Postanal porose areae (ap) absent.

**Gnathosoma.** Sucapitulum cuticle densely punctuated, covered with striated cerotegument in the anterior half, diarthric type, with mental tectum. Two pairs of *or* setae, ~7µm. Setae *a* long, ~11µm, with about twice the length of setae *h* and *m*, ~5µm (Figs. 10 B, 12 D). Palp setal formula from trochanter to tarsus 0-2-1-3-9, plus solenidium  $\omega$ . Palpal eupathidium *acm* attached to solenidium  $\omega$  (double horn) and projecting from a small protrusion (Figs. 13 B, 14 B). Chelicerae of usual robust form (chelate–dentate), densely punctuated between the *en* line and the basis of the movable digit. Setae *cha* and *chb* long and barbed, ~34 and 22µm, respectively. Trägardh's organ (*trg*) parallel to the axis of chelicerae, slightly pointing down, ~28µm (Fig. 13 D).

**Legs.** Well sclerotized, not covered with cerotegument, Most articles smooth, except Trochanter III–IV and femur I–IV, which are punctuated/striated. All pretarsi tridactylous, with lateral claws thinner than the empodium (Figs. 13 A, C, E, G, 14 A–D). Setal formulae (legs I–IV): trochanter 1–1–1–1, femur 4–4–2–2, genu 3–3–1–2, tibia 4–4–3–3 and tarsus 20–15–12 (Table 2). Leg I famulus (*e*) short, ~5 $\mu$ m, with expanded tip (Fig. 13 F). Lyrifissure *ly* in the basis of tarsus, near to arthrodial membrane, observed in the antiaxial aspect. Solenidia number, form and distribution as shown in Table 1.

**Material Examined.** Holotype (female), 28 paratypes mounted in slides (8 entire and 20 dissected), 20 paratypes mounted on a stub for SEM and 50 paratypes preserved in 70% alcohol, collected from litter samples in cacao plantations of the Universidade Estadual de Santa Cruz (UESC), Ilhéus, Bahia, in January 10–I–2008 and 13–VIII–2013 by Anibal R. Oliveira. The holotype and 18 paratypes will be deposited in the UESC Acarology Collection and 10 paratypes will be deposited in the Acarology Collection of Escola Superior de Agricultura "Luiz de Queiroz" (ESALQ), Universidade de São Paulo (USP), Piracicaba, SP, Brazil.

**Remarks.** *Pilizetes* (n. subgen.1) n. sp. A differs from *Pilizetes* (n. subgen.1) n. sp. B by the (1) 'human thorax–like' notogastral crests pattern in dorsal view, with lateral crests absent in the flat, posterior half of the notogaster ['human thorax–like' notogastral crests pattern absent, with lateral crests present in the curved, posterior half of the notogaster in *Pilizetes* (n. subgen.1) n. sp. B] and (2) porose areae *A1* and *A2* forming four large posterior protuberances on notogaster [porose areae *A1* and *A2* forming small posterior protuberances in *Pilizetes* (n. subgen.1) n. sp. B].



**FIGURE 5.** *Pilizetes* (n. subgen.1) n.sp. A: A) dorsal view; B) *ss*, sensillus; C) *in*, interlamellar setae; D) *ro*, rostral setae; E) subcapitulum; F) prodorsum crest transversal cut; G) prodorsum frontal view; H) ventral view.



**FIGURE 6.** *Pilizetes* (n. subgen.1) n.sp. A: A) dorsal view; B) dorsumlateral view; C) notogaster dorsal view; D) prodorsum frontal view; E) prodorsum dorsal view presenting *ro* setae and crests; F) prodorsum dorsal view presenting in setae.



**FIGURE 7.** *Pilizetes* (n. subgen.1) n.sp. A: A) lateral view; B) prodorsum lateral view and part of pteromorph; C) ventral view; D) subcapitulum and part of epimeral region; E) genital plate and part of epimeral region; F) anal plate, part of ventral plate and ventral view of posterior portion of the notogaster.



**FIGURE 8.** *Pilizetes* (n. subgen.1) n.sp. A: A) leg I antiaxial view; B) chelicerae antiaxial view; C) leg II antiaxial view; D) leg III antiaxial view; E) palp antiaxial view; F) leg IV antiaxial view; G) seta *e* (famulus) detail.



FIGURE 9. *Pilizetes* (n. subgen.1) n.sp. A: A) gnathosoma presenting palp and chelicerae in antiaxial view; B) palp tarsi detail; C) leg I antiaxial view; D) leg I tibia and tarsi detail;E) seta *e* (famulus) detail; F) leg I tarsi and pretarsi detail.


**FIGURE 10.** *Pilizetes* (n. subgen.1) n.sp. B: A) dorsal view; B) subcapitulum; C) *ss*, sensillus; D) *ro*, rostral setae ; E) ventral view; F) prodorsum crest transversal cut; G) prodorsum frontal view.



**FIGURE 11.** *Pilizetes* (n. subgen.1) n.sp. B: A) dorsal view; B) dorsumlateral view; C) notogaster dorsal view; D) anal view; E) frontal view; F) prodorsum detail presenting *L* and *S lines* and *ro* and *le* setae.



**FIGURE 12.** *Pilizetes* (n. subgen.1) n.sp. B: A) lateral view; B) prodorsum lateral view; C) ventral view; D) subcapitulum and part of epimeral region; E) genital plate and part of epimeral region; F) anal plate and aggenital (*ag*) setae.



FIGURE 13. *Pilizetes* (n. subgen.1) n.sp. B: A) leg I antiaxial view; B) palp antiaxial view;C) leg II antiaxial view; D) chelicerae antiaxial view; E) leg III antiaxial view; F) *s*eta*e* (famulus) detail. G) leg IV antiaxial view.



**FIGURE 14.** *Pilizetes* (n. subgen.1) n.sp. B: A) leg II, palp and chelicerae in antiaxial view; B) palp tarsi detail; C) *ss*, sensilus; D) leg IV antiaxial view.

### *Pilizetes* (n. subgen.2)

(Figs. 15–23, Table 1)

# Type species: Pilizetes (n. subgen.2) n. sp. A

**Diagnosis.** Prodorsum covered with long longitudinal crests or short spine–like crests; naso bilobed or trilobed in frontal view; lamellar (*L*) and sublamellar (*S*) lines present, parallel, lamellar seta (*le*) originated between *L* and *L*; dorsumsejugal furrow (suture) present; notogaster covered with long longitudinal crests or short spine–like crests; notogaster with a central, longitudinal depression in the anterior half, followed by a tubercle in the region delimited by setae *h1* and *p1*; pteromorph covered radially with long straight crests, with some short crest among them; two pairs of well developed saccules (*Sa* and *S2*); ten pairs of well developed and flexible notogastral setae, with setae *c2* on pteromorph; 6–1–2–3 pairs of genital, aggenital, anal and adanal setae, respectively; genital and anal apertures covered with cerotegument; seta *ad3* near to anal aperture, the distance shorter than half width of anal aperture; trägardh's organ (*trg*) pointing up.

**Remarks.** In relation to the three other subgenera of *Pilizetes*, *P.* (*Pilizetes*), *P.* (*Neopilizetes*) and *Pilizetes* (n. subgen.1), *Pilizetes* (n. subgen.2) is closer to *P.* (*Neopilizetes*) and *Pilizetes* (n. subgen.1) by the (1) surface of prodorsum, notogaster and pteromorph covered with crests [foveolate, polygonate or punctate in *P.* (*Pilizetes*)], (2) dorsumsejugal furrow (suture) present [absent in *P.* (*Pilizetes*)], (3) seta *ad3* near the anal aperture [far from anal aperture in *P.* (*Pilizetes*)]. On the other hand, *Pilizetes* (n. subgen.2) differs from *P.* (*Neopilizetes*) and *Pilizetes* (n. subgen.1) by the presence of saccules (*Sa* and *S2*) [porose areae in *P.* (*Neopilizetes*) and *Pilizetes* (n. subgen.1)].

# Pilizetes (n. subgen.2) n. sp. A

(Figs. 15–19)

**Diagnosis.** As for the new subgenus above, with the addition of the following characters: naso trilobed from dorsal view and bilobed in frontal view; prodorsum and notogaster covered with short spine–like crests; notogaster with a central, longitudinal depression in the anterior half, followed by a tubercle in the region delimited by setae h1 and p1; posterolateral margins flat; subcapitulum covered with long longitudinal crests. Setae 1c present.

**Dimensions.** Body length (n=5)  $365-394\mu$ m and width  $286-322\mu$ m. Sexual species, with males common (sex ratio not determined).

**Prodorsum.** Barely covered with cerotegument. With small, short spine–like crests covering all surface (Figs. 15 A, G, 16 E, F). Rostrum forming an elongated naso, trilobed from dorsal view and bilobed in frontal view (Figs. 15 A, G, 16 E, F). The *ro* setae are thin, with few barbs barely visible, directed medially, with about 1/2 of the distance between their bases in length (Figs. 15 A, G, 16 E, F, 17 B). The lamellar (*le*) setae are barbed, directed medially, with slightly more than 1/2 of the distance between their bases in length (Figs. 15 A, G, 16 E, F, 17 B). The lamellar (*le*) setae are barbed, directed medially, with slightly more than 1/2 of the distance between their bases in length (Figs. 15 A, C, D, G, 17 A, B). Setae *ro* with ~22µm. Setae *le* and *in* of similar lengths, ~64µm. Lamellae and tutorium absent, reduced to two narrow dorsolateral ridges, the lines *L* and S, respectively (Fig. 15 G). Lamellar setae originate medial to line *L*. Bothridial opening lateral, cup shaped (Fig. 15 A). Sensillus (bothridial seta, *ss*) thick, sharp–tipped, with a series of slightly long barbs occupying almost its entire exposed length, ~110µm (Figs. 15 B, 19 C). Dorsumsejugal furrow present (Figs. 15 A, 16 A, E).

Notogaster. Moderately covered with cerotegument. Circular to pentagonal in shape in dorsal view, with large, hinged, auriculate pteromorph and a depression posteriorly (Figs. 15 A, F, 16 A). Posterolateral margins flat and angularly bent ventrally, abruptly folding toward the ventral plate (Figs. 16 A, D). Anterior half of the notogastral surface with a central, longitudinal depression, followed by a tubercle in the region delimited by setae h1and p1 (Figs. 16 A, D). Notogastral surface entirely covered with short spine–like crests. Pteromorph covered radially with long straight crests, with some short crest among them (Figs. 15 A, 16 B). Ten pairs of well developed, flexible and barbed notogastral setae (c2, la, lm, lp, h1, h2, h3, p1, p2 and p3), most of them similar in size to the *in* setae. Setae c2 on pteromorph, ~78µm. Setae la, lm, lp, h1, h2 and h3 ~63µm. Setae p1, p2 and p3, ~27, 24 and 24µm, respectively. Five pairs of notogastral lyrifissures. (*ia* on pteromorph and *im*, *ih*, *ip* and *ips* on notogaster – just *im* observed in dorsal view). Opisthonotal gland (gla) located between the lyrifissures *ih*, *im*, *ips*, in the region of the p3 and h3 setae. Suculli Sa and S2 present. Medial pore (mp) absent (Figs. 15 A, 16 A, B, C, D).

**Ventral region.** Moderately covered with cerotegument. Epimeral setation 2–0–1–2. Setae *1b*, *1c*, *3b*, *4a* and *4b* rigid, smooth, acuminate and short, ~8µm (Fig. 15 F). The distance between the genital and anal plates about the same length of the genital plate (Figs. 15 F, 17 C). Genital aperture covered with dozens of circular portions of cerotegument, subquadrate, slightly wider anteriorly, with six pairs of setae. Setae *g1* and *g2* inserted on the anterior margin of the genital valves, ~11µm. Setae *g3*, *g4*, *g5* aligned in the middle of the genital valves and *g6* next the posterior margin, similar to the epimeral setae, ~8µm (Figs. 15 F, 17 E). Setae *ag* near the genital aperture covered with dozens of circular portions of cerotegument setae in shape, ~8µm. Anal aperture covered with dozens of circular portions of cerotegument, subcircular/pentagonal, larger than the genital aperture, slightly wider and *ad3* near the anal aperture, smooth and acuminate,  $\sim 11 \mu m$ . Lyrifissure *iad* slightly parallel to the lateral margin of the anal aperture (Fig. 17 F). Postanal porose areae (*ap*) absent.

**Gnathosoma.** Sucapitulum surface covered with longitudinal crests, diarthric type, with mental tectum (Figs. 15 E, 17 D). Two pairs of *or* setae, ~ 9µm. Setae *a*, *h* and *m* with ~14, 7 and 10µm respectively (Figs. 15 E, 17 D). Palp setal formula from trochanter to tarsus 0–2–1–3–9, plus solenidium  $\omega$ . Palpal eupathidium *acm* attached to solenidium  $\omega$  (double horn) and projecting from a small protrusion (Figs. 18 B, 19 A, B). Chelicerae of usual robust form (chelate–dentate), densely punctuated between the *en* line and the basis of the movable digit. Setae *cha* and *chb* long and barbed, ~54 and 35µm, respectively. Trägardh's organ (*trg*) pointing up, ~35µm (Fig. 18 D).

**Legs.** Well sclerotized, not covered with cerotegument, most articles smooth, except trochanter III–IV and femur I–V, which are punctuated/striated. All pretarsi tridactylous, with lateral claws thinner than the empodium (Figs. 18 A, C, E, F, 19 D). Setal formulae (legs I–IV): trochanter 1–1–1–1, femur 4–4–2–2, genu 3–3–1–2, tibia 4–4–3–3 and tarsus 20–15–15–12 (Table 1). Leg I famulus (*e*) short, ~6 $\mu$ m, with expanded tip (Fig. 18 G). Lyrifissure *ly* in the basis of tarsus, near to arthrodial membrane, observed in the antiaxial aspect. Solenidia number, form and distribution as shown in Table 1.

**Material Examined.** Holotype (female), 19 paratypes mounted in slides (4 entire and 15 dissected), 10 specimens mounted on a stub for SEM, collected from litter samples in cacao plantations of the Universidade Estadual de Santa Cruz (UESC), Ilhéus, Bahia, in January 10–I–2008 and 13–VIII–2013 by Anibal R. Oliveira. The holotype and 10 paratypes will be deposited in the UESC Acarology Collection and 9 paratypes will be deposited in the Acarology Collection of Escola Superior de Agricultura "Luiz de Queiroz" (ESALQ), Universidade de São Paulo (USP), Piracicaba, SP, Brazil.

# Pilizetes (n. subgen.2) n. sp. B

(Figs. 20–23)

**Diagnosis.** As for the new subgenus above, with the addition of the following characters: naso rounded in dorsal view and trilobed in frontal view; prodorsum and notogaster covered with variably long longitudinal crests, interspersed by a series of small, short crests; notogaster with a central, longitudinal depression in the anterior half, followed by a tubercle in the region delimited by setae h1 and p1; posterolateral margins flat; subcapitulum covered with short crests, disposed in a reticulated pattern. Setae 1c absent (represented only by alveoli).

**Dimensions.** Body length (n=3) 405–450µm and width 325–342µm. Males unknown.

**Prodorsum.** Barely covered with cerotegument. With long longitudinal crests, interspersed by a series of small, short crests, from the rostral (*ro*) setae level till the interlamellar (*in*) setae level, interrupted by a transversal flaw closer to the *in* setae (Figs. 20 A, F, 21 A, E, 22 B). Rostrum forming an elongated naso, rounded in dorsal view and trilobed in frontal view (Figs. 20 F, 21 E, F). The *ro* setae are thin, with few barbs barely visible, directed medially, with about 1/2 of the distance between their bases in length (Figs. 20 A, F, 21 F). The lamellar (*le*) setae are barbed, directed medially, with slightly more than 1/2 of the distance between their bases in length (Figs. 20 A, C, 21 A, E, 22 A). Setae *ro* with ~20µm. Setae *le* and *in* with ~72 and 65µm, respectively. Lamellae and tutorium absent, reduced to two narrow dorsolateral ridges, the lines *L* and S, respectively. Lamellar setae originate mediad to line *L*. Bothridial opening lateral, cup shaped (Fig. 20 A). Sensillus (bothridial seta, *ss*) thick, sharp–tipped, with a series of slightly long barbs occupying almost its entire exposed length, ~105µm (Figs. 20 B, 21 C). Dorsumsejugal furrow present (Figs. 20 A, 21 E, 22 A).

Notogaster. Moderately covered with cerotegument. Circular to pentagonal in shape in dorsal view, with large, hinged, auriculate pteromorph and a depression posteriorly (Figs. 20 A, E, 21 A). Posterolateral margins flat. Anterior half of the notogastral surface with a central, longitudinal depression, followed by a tubercle in the region delimited by setae h1and p1 (Figs. 20 A, 21 A). Notogastral surface entirely covered with variably long longitudinal crests, interspersed by a series of small, short crests (Figs. 20 A, 21 A, B, C, D, 22 A). Pteromorph covered radially with long straight crests, with some short crest among them (Fig. 20 A). Ten pairs of well developed, flexible and barbed notogastral setae (c2, la, lm, lp, h1, h2, h3, p1, p2 and p3), most of them similar in size to the *in* setae. Setae c2 on pteromorph, ~75µm. Setae la, lm, lp, h1, h2 and h3 ~68µm. Setae p1, p2 and p3, ~38, 21 and 35µm, respectively. Five pairs of notogastral lyrifissures. (*ia* on pteromorph and *im*, *ih*, *ip* and *ips* on notogaster – just *im* observed in dorsal view). Opisthonotal gland (gla) located between the lyrifissures *ih*, *im*, *ips*, in the region of the p3 and h3 setae. Suculli Sa and S2 present. Medial pore (mp) absent (Fig. 20 A, 21 A, B, D).

**Ventral region.** Densely covered with cerotegument. Epimeral setation 2–0–1–2. Setae *1b*, *3b*, *4a* and *4b* rigid, smooth, acuminate and short, ~8µm (Fig. 20 E). Setae *1c* represented only by alveoli. The distance between the genital and anal plates about the same length of the genital plate (Fig. 20 E). Genital aperture covered with dozens of circular portions of cerotegument, subquadrate, slightly wider anteriorly, with six pairs of setae. Setae *g1* and *g2* inserted on the anterior margin of the genital valves, ~9µm. Setae *g3*, *g4*, *g5* aligned in the middle of the genital valves and *g6* next the posterior margin, similar to the epimeral setae, ~7µm (Figs. 20 A, 22 E). Setae *ag* proximately near the genital aperture, smooth and acuminate, similar to the epimeral setae in shape, ~8µm. Anal aperture covered with dozens of circular portions of cerotegument, subcircular/pentagonal, larger than the genital aperture, slightly wider posteriorly, with two pairs of setae, *an2* and *an3*, ~9µm. Setae

*ad1*, *ad2* and *ad3* near the anal aperture, smooth and acuminate,  $\sim 13 \mu m$ . Lyrifissure *iad* parallel to the lateral margin of the anal aperture (Fig. 20 E, 22 F). Postanal porose areae (*ap*) absent.

**Gnathosoma.** Sucapitulum surface covered with short crests, disposed in a reticulated pattern, diarthric type, with mental tectum (Figs. 20 D, 22 D). Two pairs of *or* setae, ~ 11µm. Setae *a* long, ~22µm. Setae *h* and *m*, ~17µm (Fig. 20 E). Palp setal formula from trochanter to tarsus 0–2–1–3–9, plus solenidium  $\omega$ . Palpal eupathidium *acm* attached to solenidium  $\omega$  (double horn) and projecting from a small protrusion (Fig. 23 B). Chelicerae of usual robust form (chelate–dentate), densely punctuated between the *en* line and the basis of the movable digit. Setae *cha* and *chb* long and barbed, ~46 and 34µm, respectively. Trägardh's organ (*trg*) pointing to up, ~32µm (Fig. 23 D).

**Legs.** Well sclerotized, not covered with cerotegument, most articles smooth, except trochanter III–IV and femur I–IV, which are punctuated/striated. All pretarsi tridactylous, with lateral claws thinner than the empodium (Fig. 23 A, C, E, G). Setal formulae (legs I–IV): trochanter 1–1–1–1, femur 4–4–2–2, genu 3–3–1–2, tibia 4–4–3–3 and tarsus 20–15–15–12 (Table 1). Leg I famulus (*e*) short, ~6 $\mu$ m, with expanded tip (Fig. 23 F). Lyrifissure *ly* in the basis of tarsus, near to arthrodial membrane, observed in the antiaxial aspect . Solenidia number, form and distribution as shown in Table 1.

**Material Examined.** Holotype (female), 2 paratypes mounted in slides (dissected), 2 specimens mounted on a stub for SEM, collected from litter samples in cacao plantations of the Universidade Estadual de Santa Cruz (UESC), Ilhéus, Bahia, in January 10–I–2008, 13– VIII–2013 and 22–III–2015 by Anibal R. Oliveira and Saulo S. Amorim. The holotype and 3 paratypes will be deposited in the UESC Acarology Collection and 1 paratype will be deposited in the Acarology Collection of Escola Superior de Agricultura "Luiz de Queiroz" (ESALQ), Universidade de São Paulo (USP), Piracicaba, SP, Brazil. **Remarks.** *Pilizetes* (n. subgen.2) n. sp. A differs from *Pilizetes* (n. subgen.2) n. sp. B by the (1) naso trilobed from dorsal view and bilobed in frontal view [naso rounded in dorsal view and trilobed in frontal view *Pilizetes* (n. subgen.2) n. sp. B], (2) prodorsum and notogaster covered with short spine–like crests [prodorsum and notogaster covered with short spine–like crests [prodorsum and notogaster covered with variably long longitudinal crests, interspersed by a series of small, short crests in *Pilizetes* (n. subgen.2) n. sp. B], (3) subcapitulum covered with long longitudinal crests [subcapitulum covered with short crests, disposed in a reticulated pattern in *Pilizetes* (n. subgen.2) n. sp. B] and (4) Setae *1c* present [Setae *1c* absent (represented only by alveoli) in *Pilizetes* (n. subgen.2) n. sp. B].



**FIGURE 15.** *Pilizetes* (n. subgen.2) n.sp. A: A) dorsal view; B) *ss*, sensillus; C) *le*, lamellar setae; D) *in*, interlamellar setae; E) subcapítulum; F) ventral view; G) prodorsum frontal view.



**FIGURE 16.** *Pilizetes* (n. subgen.2) n.sp. A: A) dorsal view; B) lateral view; C) notogastral setae detail; D) anal view; E) frontal view; F) prodorsum detail.



**FIGURE 17.** *Pilizetes* (n. subgen.2) n.sp. A: A) *in*, interlamellar setae detail; B) *le*, lamellar and *ro*, rostral setae detail; C) ventral view; D) subcapitulum; E) genital aperture; F) anal aperture.



**FIGURE 18.** *Pilizetes* (n. subgen.2) n.sp. A: A) leg I antiaxial view; B) palp antiaxial view; C) leg II antiaxial view; D) chelicerae antiaxial view; E) leg III antiaxial view; F) leg IV antiaxial view; G) seta *e* (famulus) detail.



**FIGURE 19.** *Pilizetes* (n. subgen.2) n.sp. A: A) palp antiaxial view; B) palp detail in antiaxial view; C) *ss*, sensillus; D) leg IV tibia and tarsi.



**FIGURE 20.** *Pilizetes* (n. subgen.2) n.sp. B: A) dorsal view; B) *ss*, sensillus; C) *in*, interlamellar setae; D) subcapitulum; E) ventral view; F) prodorsum frontal view.



**FIGURE 21.** *Pilizetes* (n. subgen.2) n.sp. B: A) dorsal view; B) dorsal setae detail; C) *ss*, sensillus; D) *la* setae; E) notogaster dorsal view; F) prodorsum detail presenting the naso.



**FIGURE 22.** *Pilizetes* (n. subgen.2) n.sp. B: A) *in*, interlamellar setae; B) *le*, lamellar setae; C) ventral view; D) subcapitulum; E) genital aperture; F) anal aperture.



**FIGURE 23.** *Pilizetes* (n. subgen.2) n.sp. B: A) leg I antiaxial view; B) palp antiaxial view; C) leg II antiaxial view; D) chelicerae antiaxial view; E) leg III antiaxial view; F) seta *e* (famulus) detail. G) leg IV antiaxial view.

**TABLE 1.** Leg setae and solenidia of *Pilizetes (Neopilizetes) neotropicus, Pilizetes* (n. subgen.1) n. sp. A and B, *Pilizetes* (n. subgen.2) n. sp. A and B adults (setae in parentheses represent pairs).

	Trochanter	Femur	Genu	Tibia	Tarsus
Leg I	<i>v</i> ″	d, bv'', (l)	(l), ν', σ	(l), (v), <i>φ</i> 1, <i>φ</i> 2	(ft), (tc), (it), (p), (u),
					(a), (pv), (pl), v', l'',
					s, e, ω1, ω2,
Leg II	<i>v</i> ″	d, bv", (l)	(l), ν', σ	(l), (v), φ	(ft), (tc), (it), (p), (u),
					(a), (pv), s, ω1, ω2
Leg III	<i>v'</i>	d, ev'	l', σ	l', (ν), φ	(ft), (tc), (it), (p), (u),
					(a), (pv), s
Leg IV	<i>v'</i>	d, ev'	l', d	l', (ν), φ	ft", (tc), (p), (u), (a),
					( <i>pv</i> ), <i>s</i>

### Expanded diagnosis of the genus Pilizetes Sellnick, 1937

The genus *Pilizetes* Sellnick, 1937 is keyed as a Galumnidae Jacot, 1925 (Oribatida: Brachypylina: Galumnoidea) based on Norton and Behan–Pelletier (2009). The following diagnosis of *Pilizetes* Sellnick, 1937 is a compilation of the characters of the genus presented on the original diagnosis (Sellnick 1937), on all the species descriptions (see Introduction for review), on the diagnosis and keys of Balogh and Balogh (1990, 1992, 2002), and on the descriptions presented in this paper.

**Diagnosis:** According the diagnosis of the superfamily Galumoidea presented in Norton and Behan–Pelletier (2009), with the addition of the following characters: prodorsum, notogaster and pteromorph with sculpture, covered with foveola, polygona, punctuations or longitudinal crests (striae); lamellar seta (*le*) originated between lines *L* and *L*; dorsumsejugal furrow present or absent; presence of 10 well developed pairs of notogastral setae, bacilliform or setiform, about equal or shorter than sensillus in length; 6-1-2-3 pairs of genital, aggenital, anal and adanal setae, respectively; seta *ad3* far or near to anal aperture, if near (the distance shorter than half width of anal aperture), dorsumsejugal furrow present and notogaster covered with crests; chelicerae chelate–dentate.

# Identification key to the *Pilizetes* subgenera and species of the world (adults only)

**Remarks**: *Pilizetes (Neopilizetes) rugifrons* (Stoll, 1891) "sp. inq." excluded. Separation and measurements of the *Pilizetes (Pilizetes)* species largely based on the 'Pilizetoid group' key presented in Balogh and Balogh (2002). Distribution of the species based on Subías (2004 – update online 2015).

2' Octotaxic system with saccules (*Sa* and *S2*) ...... *Pilizetes* (n.subgen.2) ...... 5

- 3' Top of crests in the prodorsum not flattened as above; notogaster covered with longitudinal crests originating mostly from the dorsumsejugal furrow; three pairs of small porose areae (*Aa*, *A1* and *A3*) present, not forming protuberances on notogaster; setae *p1* not set in two terminal protuberances. Length: 308–408μm. Brazil and Mexico

# .....Pilizetes (Neopilizetes) neotropicus Balogh and Mahunka, 1978

(Figs. 1–4, 24 A, B)

4 'Human thorax–like' notogastral crests pattern in dorsal view, with lateral crests absent in the flat, posterior half of the notogaster; porose areae *A1* and *A2* forming

54

(Figs. 5-9)

4' 'Human thorax–like' notogastral crests pattern absent, with lateral crests present in the curved, posterior half of the notogaster; porose areae *A1* and *A2* forming small posterior protuberances on notogaster. Length 300–350μm – Brazil .....

(Figs. 10-14)

5 Prodorsum and notogaster covered with short spine–like crests; naso trilobed from dorsal view and bilobed in frontal view; subcapitulum covered with long longitudinal crests; setae *lc* present. Length: 365–394µm – Brazil...... *Bilizates* (n subcon 2) n on A

......Pilizetes (n.subgen.2) n. sp A

(Figs. 15–19)

5' Prodorsum and notogaster covered with variably long longitudinal crests, interspersed by a series of small, short crests; naso rounded in dorsal view and trilobed in frontal view; subcapitulum covered with short crests, disposed in a reticulated pattern; setae *lc* absent (represented only by alveoli). Length: 405–450µm – Brazil.....

(Figs. 20–23)

6 Sensillus clavate, rounded– tipped ......7

(Figs. 24 C, D, E)

(Figs. 25 A, B)

(Figs. 25 C, D)

10 Prodorsum with two transversal structures, the first connecting interlamellar setae, and the second in the level of lamellar setae. Length: 377–402µm – Kenya ...... *Pilizetes (Pilizetes) denticulatus Mahunka, 1986* 

(Figs. 26 A, B, C)

10'	Prodorsum without transversal structures. Length: $514-597\mu m$ – Comores Island		
	Pilizetes (Pilizetes) tuberculatus Mahunka, 1994		
	(Figs. 26 D, E)		
11	Prodorsum and notogaster with large, irregular polygonal sculpture. Length: 372-		
	392µm – Tchad		
	Pilizetes (Pilizetes) dudichi Balogh, 1966		
	(Fig. 27 A)		
11'	Prodorsum and notogaster without large polygonal sculpture: foveolate or punctate		
12	Interlamellar setae length about 1/3 the distance between their basis. Length: 372-		
	392µm – Tanzania		
	Pilizetes (Pilizetes) brevisetus Mahunka, 1984		
	(Fig. 27 B, C)		
12'	Interlamellar setae length longer or about as long as half the distance between their		
	basis 13		
13	Notogastral setae short, pteromophal setae $(c2)$ at least three times longer than		
	notogastral setae. Length: 328–350µm – Congo		
	Pilizetes (Pilizetes) curtipilus Balogh, 1960		

(Fig. 28 A, B)

13'	Notogastral setae long, pteromophal setae $(c2)$ about equal or at most twice longer
	than notogastral setae14
14	Pteromophal setae (c2) much longer than sensillus Length: $390\mu m$ – Angola
	Pilizetes (Pilizetes) sellnick Balogh, 1960
	(Fig. 28 C, D)
14'	Pteromophal setae (c2) about equal or shorter than sensillus 15
15	Sensillus on the apical half first gradually dilated, then abruptly narrowing, with
	setiform tip
15'	Sensillus gradually narrowing17
16	Seta $lm$ more than half the distance $lm-lp$ ; seta $ad1$ as long as half the width of anal
	aperture. Length: 387–410µm – South Africa
	Pilizetes (Pilizetes) australis J. Balogh & P. Balogh, 1966
	(Fig. 29 A, B)
16'	Seta <i>lm</i> less than half the distance <i>lm</i> – <i>lp</i> . seta <i>ad1</i> shorter than half the width of anal
	aperture. Length: 385µm – Tanzania
	Pilizetes (Pilizetes) africanus Sellnick, 1937
	(Fig. 29 C, D)
17	Notogaster punctuate. Length: 363–395µm – Tanzania
	Pilizetes (Pilizetes) subglaber J. Balogh & P. Balogh, 1966
	(Fig. 30 A, B)

17'	Notogaster densely foveolate
18	Pteromophal setae $(c2)$ longer than notogastral setae. Genital and anal plates without
	sculpture. Length: 343–372µm – Tanzania
	Pilizetes (Pilizetes) saskai Balogh, 1958
	(Fig. 30 C, D)
18'	Pteromophal setae $(c2)$ shorter than notogastral setae. Genital and anal plates with
	sculpture. Length: 343–372µm – Tanzania

(Fig. 31 A, B)



**FIGURE 24.** *Pilizetes* (*N.*) *neotropicus* (Balogh and Mahunka, 1978): A) dorsal view; B) ventral view; *Pilizetes* (*P.*) *subsimmilis* Mahunka, 1984: C) sensillus detail; D) dorsal view; E) ventral view.



FIGURE. 25. *Pilizetes (P.) csoengeyi* Mahunka, 1983: A) dorsal view; B) ventral view; *Pilizetes (P.) anufrievi* Ermilov et al, 2010: C) dorsal view; D) ventral view.



**FIGURE 26.** *Pilizetes (P.) denticulatus* Mahunka, 1986: A) dorsal view; B) ventral view; C) sensillus and pteromorph detail; *Pilizetes (P.) tuberculatus* Mahunka, 1994: D) dorsal view; E) ventral view.



**FIGURE 27.** *Pilizetes* (*P.*) *dudichi* Balogh, 1966: A) dorsal view; *Pilizetes* (*P.*) *brevisetus* Mahunka, 1984: B) dorsal view; C) ventral view.





**FIGURE 28.** *Pilizetes* (*P.*) *curtipilus* Balogh, 1960: A) dorsal view; B) ventral view; *Pilizetes* (*P.*) *sellnicki* Balogh, 1958: C) dorsal view; D) ventral view.



**FIGURE 29.** *Pilizetes (P.) australis* Balogh and Mahunka, 1966: A) dorsal view; B) ventral view; *Pilizetes (P.) africanus* Sellnick, 1937: C) dorsal view; D) ventral view.


**FIGURE 30.** *Pilizetes (P.) subglaber* Balogh, 1962: A) dorsal view; B) ventral view; *Pilizetes (P.) saskai* Mahunka, 1969: C) dorsal view; D) ventral view.



FIGURE 31. Pilizetes (P.) basilewskyi Balogh, 1958: A) dorsal view; B) ventral view.

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