



RESEARCH PAPER

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Description of *Psyllaephagus blastopsyllae* sp.n. (Encyrtidae), new species, endoparasitoid of *Blastopsylla occidentalis* Taylor (Psyllidae, Spondyliaspidae) in Cameroon

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Abstract

Eucalypts are tropical and subtropical plants used in manufacture and medicine in Africa. This plant hosted various pests among which are psyllids, *Blastopsylla occidentalis* Taylor. The control strategies of this pest around the world are based on chemical control and no parasitoid was identified until now. A new species of the genus *Psyllaephagus*, an endoparasitoid of *Blastopsylla occidentalis* (Psyllidae, Spondyliaspidae) is described. The new species, *Psyllaephagus blastopsyllae* sp.n., is similar to *P. viridis* Prinsloo, 1981, but differs in having the more densely pubescent scutellum (covered with 55-60 setae or more), the toruli being situated below the lower eye margins, the shorter antennal scape of female (just 3.5-4.0 times longer than broad), and the shorter (about twice as long as broad) antennal scape of male.

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Introduction

Eucalypts (*Eucalyptus* spp., Myrtaceae) are planted in many tropical and subtropical countries. They are the most often planted trees in the arid and semi-arid zones of the World and are naturalized in a large number of regions. The wood of the eucalypts essentially serves contributes to various products ranging from the fire wood, coal, wood, pegs, pillars and tools to dough and paper (Bolza and Keating, 1972). The leaves of eucalypts are used by the traditional medicine to treat malaria, asthma, urinary and skin diseases, pains of stomach and dysmenorrhea (Burkill, 1997). The essential oil extracted from the eucalyptus leaves is used in expectorants against cough (Burkill, 1997). In Cameroon, eucalypts were planted to face the increasing shortage of woods and are also used to dry wetlands. In different regions eucalypts are associated with diverse insects, which generally represent of a mix of natural and introduced (of Australasian origin) elements. Some of these insects cause serious damages to their host plants: *Gonipterus scutellatus* (Coleoptera: Curculionidae) (Hanks *et al.*, 2000), *Phorancatha semipunctata* (Coleoptera: Cerambycidae) (Hanks *et al.*, 2001) and *Blastopsylla occidentalis* (Hemiptera Psylloidea) (Taylor, 1985), *Leptocybe invasa* (Mendel *et al.*, 2004) and *Ophelimus maskelli* (Eulophidae) (Protasov *et al.*, 2007) to list some.

Among the major pests of *Eucalyptus* spp. is *Blastopsylla occidentalis* Taylor. This psyllid originates from West and South Australia (Taylor, 1985; Hollis, 2004; Clark and Dallwitz, 1974). Up to now it has been introduced also to Argentina (Bouvet *et al.*, 2005), Brazil (Santana and Burckhardt, 2007, Queiroz *et al.*, 2012), Cameroon (Tamesse *et al.*, 2010), Chile (Burckhardt and Elgueta 2000), Hong Kong (Hollis, 2004), Mexico (Hodkinson, 1991), New Zealand, Paraguay (Maschio *et al.* 1997, Burckhardt *et al.*, 1999), Kenya, South Africa (Anonymous, 2007) and USA (Gill, 2000). Tamesse *et al.* (2010) reported recently *B. occidentalis* from Cameroon, where this psyllid attacks various *Eucalyptus* species. According

to Burckhardt and Misfud (1998), *B. occidentalis* may contribute to the degeneracy of the eucalypt trees throughout the main area of its distribution. The control of *Blastopsylla occidentalis* populations and other pests of eucalyptus, has been provided by chemical means in Cameroon so far, however the use of insecticides has not resulted in a significant reduce of the infestation level (Tamesse *et al.*, 2010). So, a search of sustainable and effective approaches to reduce pest pressing on eucalypts is rather actual, and a search for prospective biocontrol agents may happen to be a clue. Several natural enemies were recorded for *B. occidentalis*: e.g. the syrphid and dolichopodid flies (Diptera), the common lacewings (Neuroptera, Chrysopidae) and ladybird beetles (Coleoptera, Coccinellidae) in Brazil (Santana and Burckhardt, 2007). However, no hymenopteran parasitoids were recorded so far. But others eucalypt-damaging psyllids are parasited by hymenopteran parasitoids of *Psyllaephagus* genus e.g. *Glycaspis brimblecombei* Moore is parasited by *P. bliteus* Riek in Australia (Dahlsten *et al.*, 1998, Daane and Paine, 2005) and *Ctenarytaina eucalypti* Maskell is infested by *P. pilosus* Noyes in Australia and New Zealand (Dahlsten *et al.*, 1998, Rodríguez and Sáiz, 2006). *Psyllaephagus* Ashmead (Encyrtidae) is a cosmopolitan genus of the psyllid-associated parasitoids; it includes 231 species Worldwide, and 28 species are recorded for Afrotropical region (Prinsloo, 1981, 1983; Noyes, 2012).

During one year survey in Yaounde region (Cameroon), we studied the parasitism of *B. occidentalis* in natural conditions and the complex of hymenopteran parasitoids of this psyllid. The purpose of this paper is to describe a new species of *Psyllaephagus* attacking *Blastopsylla occidentalis* in Cameroon. This species may be considered a potential biological control agent in future.

Material and methods

Type series deposit

The type series of *Psyllaephagus blastopsyllae* sp.n. (**Fig. 1A**) and the specimens of its host, the Eucalypts

psyllid, *Blastopsylla occidentalis*, were deposited in the collections of the Laboratory of Zoology, University of Yaounde, Cameroon (LZUY) and the Royal Museum for Central Africa (RMCA), Tervuren, Belgium.

Field survey

The observations and surveys took place at non-sprayed eucalypt plantations once a week, from July 2010 to June 2011 in a tourist park “bois Sainte Anastasie”, Yaounde, Cameroon (11° 31' N, 3°51'E, altitude 759 m, Mfoundi Division, Center Region). During each week of our survey, 51 young 4-7 years-old trees of *Eucalyptus globulus* (Labillardière), *Eucalyptus deglupta* Blume and *E. saligna* Smith were inspected and the number of final instars and mummified larvae were counted.

Rearing of adults hymenopterans parasitoids

More than 4500 larvae and mummies of *Blastopsylla occidentalis* (**Fig. 1B**) were collected during this time. Under laboratory conditions, mummified larvae were kept in Petri dishes and reared parasitoids were preserved either dry or in 70% alcohol. Wasps emerge through an exit hole in the abdomen of the mummy (**Fig. 1C**).

Observations and illustrations

The alcohol-preserved specimens were then dried by the Critical-Point Drying apparatus (Bal-TEK CPD 30) in RMCA. Some specimens were slide mounted. The morphology was illustrated using transmission (Leica stereomicroscope) and Scanning Electron Microscopy (JEOL JSM-6480LV) in RMCA.

Terminologies

The terminologies used for the description follow Prinsloo (1981, 1984) and Tamesse and Tiyo (2007).

Results and discussion

Description of *Psyllaephagus blastopsyllae* sp.n.

Description of female

Colour

Female (Fig. 2A). Length: 0.9-1.4 mm. Colour: body metallic green (scrobal area of female with a weak purple sheen), head darker than the thorax and paler than metasoma. Antenna scape brownish except distal end, pedicel brownish except distal, funicle yellowish to whitish. Fore and mid legs whitish to pale yellow except all coxae brownish to darker, hind femora brownish to darker, hind tibia pale yellow with a narrow dark spot subbasally.

Structure

Head and antenna

Head in dorsal view (**Fig. 2C**) 2.4 – 2.7 times as broad as long medially; occipital margin rounded]. Head finely but distinctly reticulate. Head in frontal view slightly broader than high, antennal toruli situated below lower eye margins; lateral margin of scrobes weakly depressed. Mandible with three teeth (**Fig. 2D**). Antenna (**Figs. 2B, 3A**) with scape slender, but somewhat wider in its mid part and narrower at its ends, about 3.5–4.0 times as long as broad; pedicel 1.8 times as long as wide; F1 (smallest) 1.2 times wider than long; F2 and F3 subequal, 1.3 times wider than long; F4 1.4 times wider than long and F5 and F6 1.5 times wider than long; F6 largest. Pedicel longer than any funicle segment, F2-F6 with multiporous plate sensilla or rhinaria, clava three-segmented and as long as F3-F6 combined.

Thorax

Mesosoma somewhat more than twice as long as head, reticulated similarly to head; 1.4 times as long as broad. Scutellum slightly broader than long, sculptured with meshes arranged into virtually circular rows. Mesoscutum and scutellum densely haired; scutellum with about 60 or more setae (**Fig. 2E**). Propodeum smooth, present as a narrow strip. Spur of mid leg about 0.6 times as long as its basitarsus, which 2.5 times as long as terminal

tarsomere (**Fig. 4A**). Basal part of forewing (Fig. 3B) densely setose from about halfway along submarginal vein to speculum, the latter complete; venation as in **Fig. 3C**; setae of marginal fringe along distal wing margin 0.6 times as long as setae on submarginal vein. Metasoma as long as mesosoma; ovipositor, nearly as long as a gaster, as long as middle tibia, 3.5 times as long as gonostyli, which is half longer than midtibial spur.

Description of male

Male (**Fig. 1A**) body colour similar to female; antenna pale except pedicel, which darkened in about its basal

half. Legs same as in female, but infumation of hind tibia is broader (about its basal third). Antenna as in **Fig. 4C**. Scape flattened and widened medially, about 1.8-2.0 times as long as than wide. Pedicel nearly transverse, 1.3-1.5 times as broad as long. Flagellar segments bear curved setae, which are longer than breadth of their segments. Funicle six-segmented: F1 and F2 subequal, F3-F5 subequal, F6 slightly longer than F1-F2 and shorter than F3-F5. Club unsegmented, somewhat rounded at its apex. Male genitalia with two elongate bidentate digiti (**Fig. 4B**).

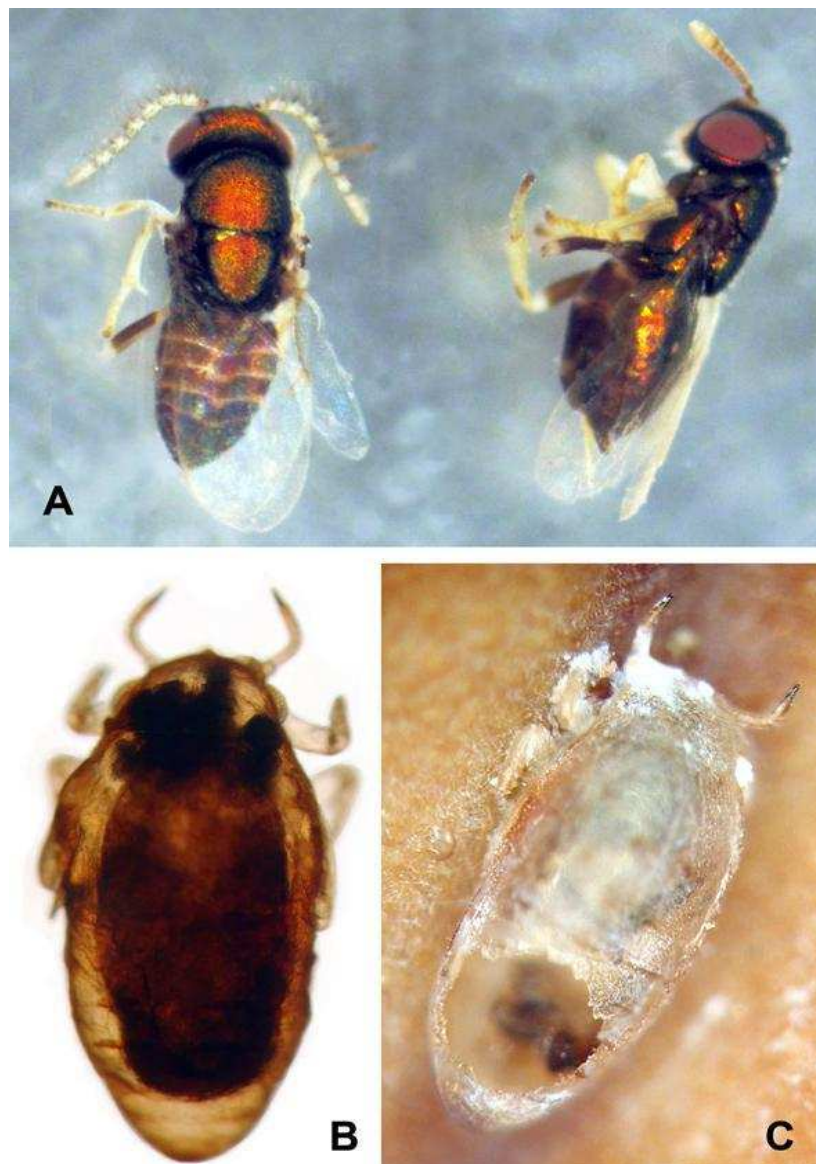


Fig.1. *Psyllaephagus blastopsyllae* sp.n., A – habitus (left – male, right - female); B - mummified larvae of *B. occidentalis* with the parasitoid praepupa inside; C – exuvia of mummy.

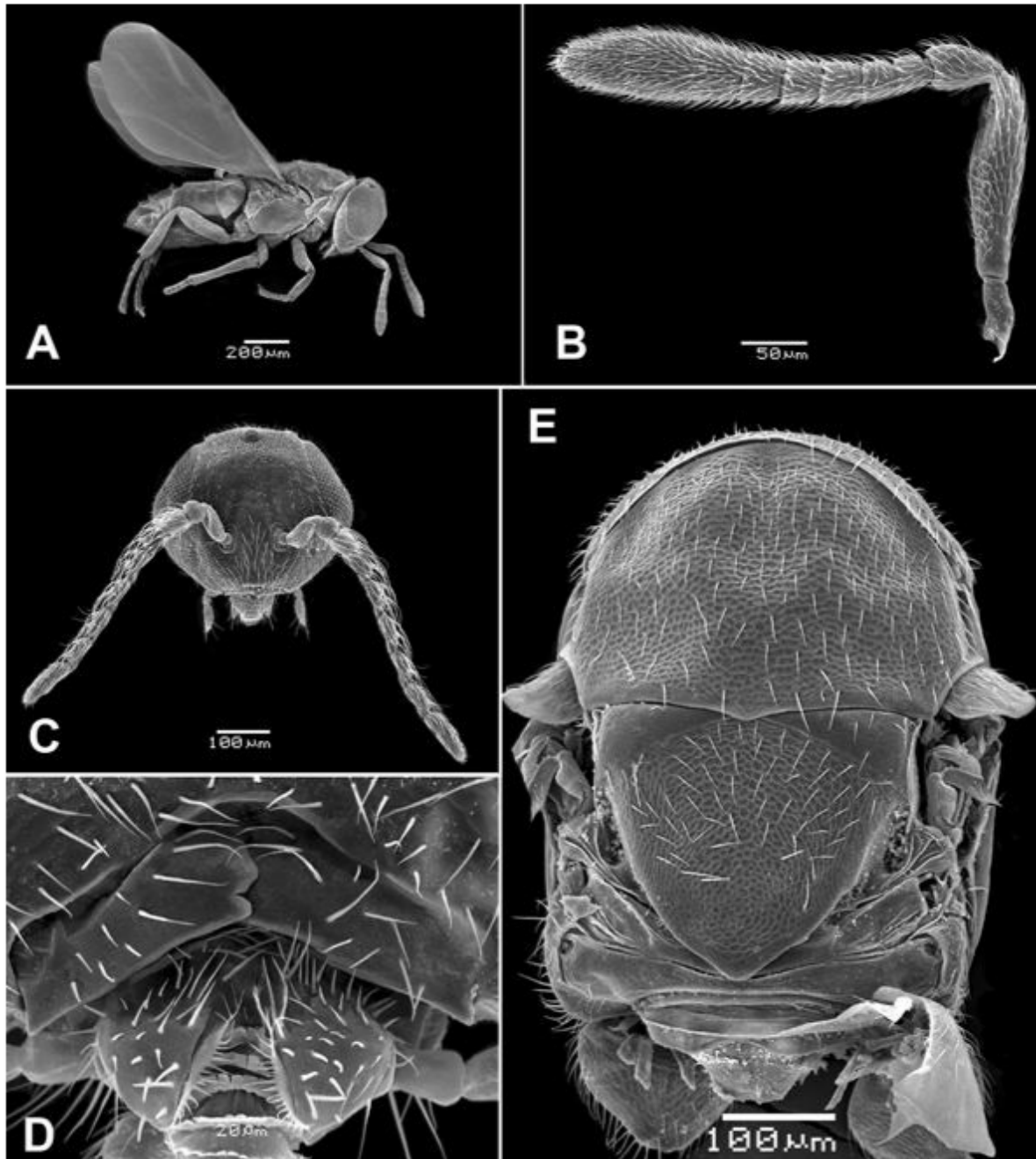


Fig. 2. *Psyllaephagus blastopsyllae* sp.n., A – female habitus (lateral view); B- female antenna; C- male head (frontal view); D - mandible; E - mesosoma and scutellum.

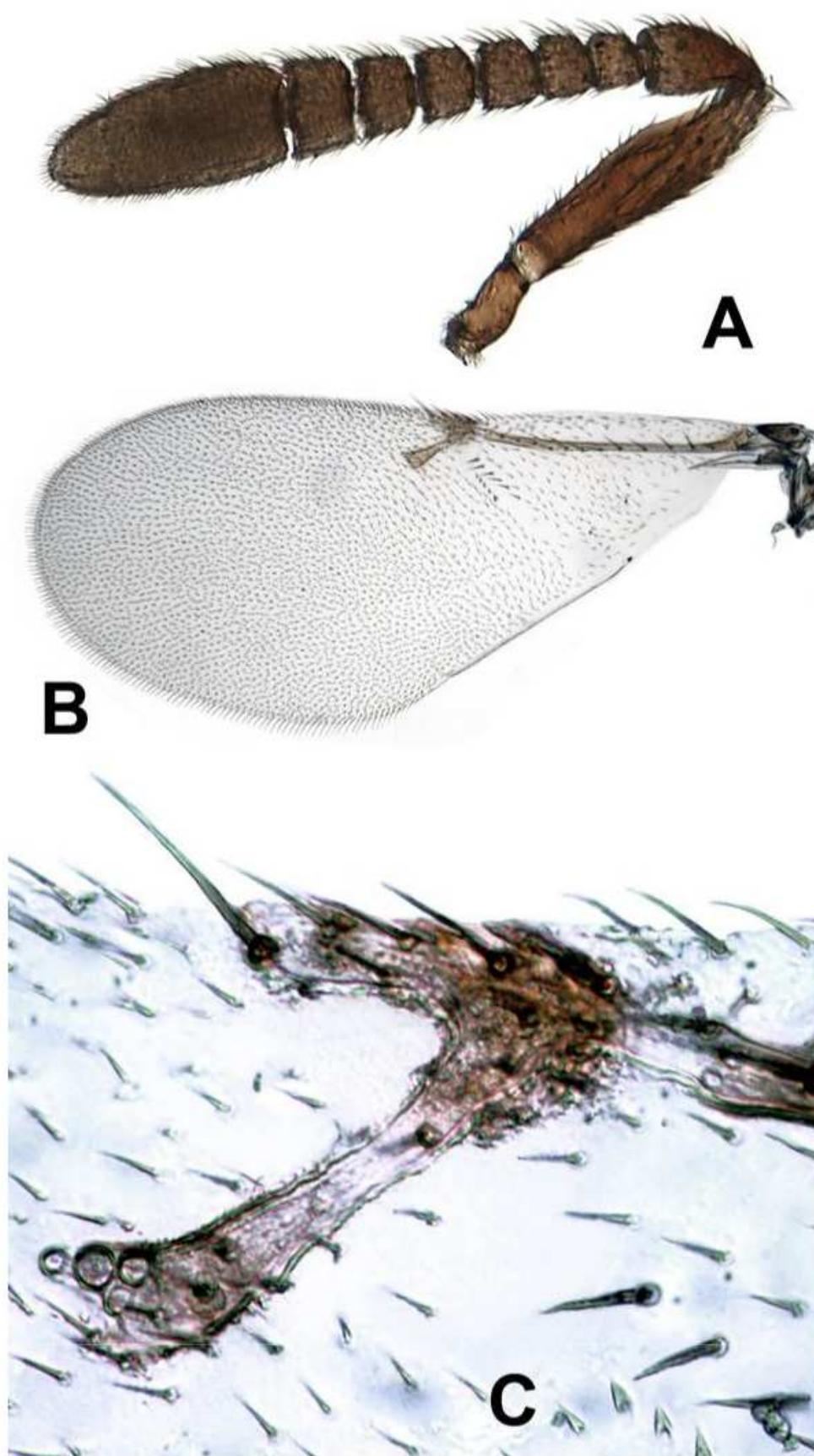


Fig. 3. *Psyllaephagus blastopsyllae* sp.n., A- female antenna ; B- forewing; C - forewing venation.

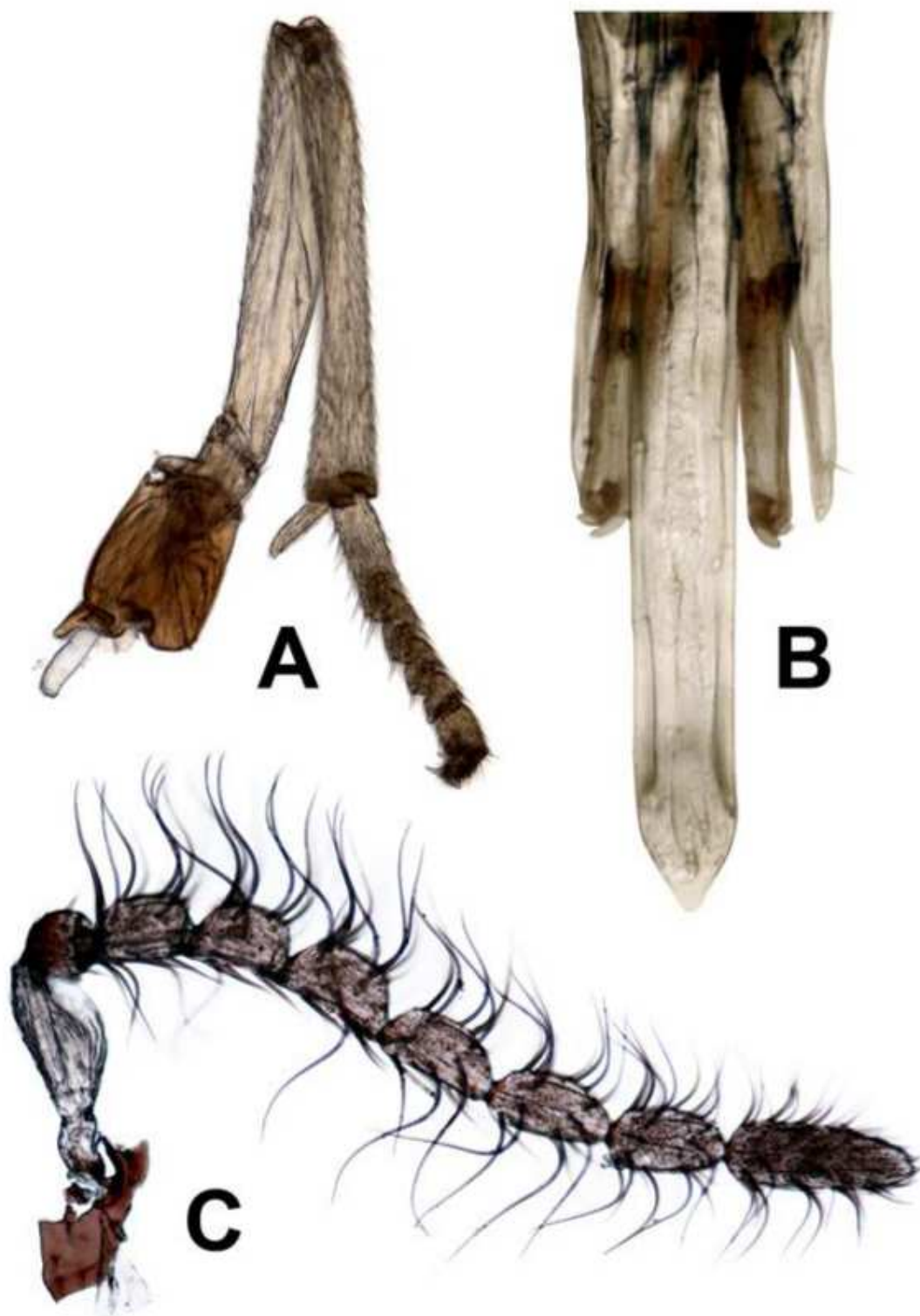


Fig. 4. *Psyllaephagus blastopsyllae* sp.n., A - mid leg; B – aedgenus; C- male antenna.

Etymology

The newly described *Psyllaephagus* species is named referring to its host, *Blastopsylla occidentalis*.

Types

Holotype: female, Cameroon, Yaounde, bois Sainte Anastasie, 11° 31' N, 3°51'E, altitude 759 m, Mfoundi Division, Center Region, ex mummies of *Blastopsylla*

occidentalis on an eucalypt tree, reared 21.xii.2010 (RMCA). Paratypes: 16 females, 9 males, *ibid.* (RMCA); 2 females, 2 males (BMNH), 19 males, 10 females, *ibid.*, 21 xii 2010 (LZUY); 9 males, 10 females, Yaounde, *ibid.*, 07.vii.2011; 29 females, 23 males, *ibid.*, 15.vii.2010 (J.L. Tamesse & L. Soufo) (LZUY) **Non-type series.** 5 females, 8 males dry, slide-mounted and preserved in 70% ethanol; dissected for morphology studies (LZUY).

Comparative notes

Psyllaephagus blastopsyllae sp.n., is very close to *P. viridis* associated with the nymphs of *Diaphorina punctulata* Pettey, *Diaphorina loranthe* Capener, *Diaphorina* sp., psyllid of *Lopholaena coriifolia* (Sond.) E.Phillips & C.A.Sm., *Tapinanthus natalitius* (Meisn.) Danser and *Tapinanthus* sp. in South Africa (Prinsloo 1981). However, the new species differs

from *P. viridis* as mentioned in the Table 1. The new species of hymenopteran parasitoid of *B. occidentalis* is described in Cameroon for the first time. Taylor (1985) described the new eucalypt psyllids, *B. occidentalis*, from Australia and, since, this psyllid was recorded in various parts of the world without no record on its parasitoid complex. Also, Prinsloo (1981) who described all the existing parasitoids of psyllids in Africa didn't give any information about the parasitoid of *B. occidenalis*. So, the newly described parasitoid is a primary parasitoid; he laid eggs directly on psyllids nymphs and may reduced the level of the infestation of the host plant during the psyllids outbreaks. *P. blastopsyllae* could be introduced in others countries where this psyllid is already present for an integrated pest management against *B. occidentalis*.

Table 1. Differences between *P. viridis* Prinsloo and *P. blastopsyllae* sp.n.

Character	<i>P. viridis</i> Prinsloo	<i>P. blastopsyllae</i> sp.n.
Host psyllid species	<i>Diaphorina</i> spp., South Africa	<i>Blastopsylla occidentalis</i> , Cameroon
Upper limits of toruli	at the same level with lower eye margins	Below lower eye margins
Female scape	3.8 times as long as broad	3.5 - 4 times as long as broad,
F1	subquadrate	1.2 times wider than long
F2	subquadrate and subequal to F1	1.3 times wider than long
F3	quadrate	subequal to F2
F4	quadrate and subequal to F3	1.4 times wider than long
F5	quadrate	1.5 times wider than long
F6	quadrate	1.2 times wider than long
Female clava	1.8 times as long as broad	2.5 times as long as broad
CL1	with 2 rhinaria	with 4 rhinaria
CL2	with 2 rhinaria	with 4 rhinaria
CL3	with 1 rhinarium	with 2 rhinaria
male scape	3 times as long as broad	2 times as long as broad
setae on scutellum	30-40	55-60

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