A ‘mid’-Cretaceous piece of Burmese amber with a new genus and two new insect species
(Odonata: Burmaphlebiidae & ‘Psocoptera’: Compsocidae)

Valerie Ngô-Muller\textsuperscript{a,b}, Romain Garrouste\textsuperscript{b}, André Nel\textsuperscript{b,*}

\textsuperscript{a}UFR Sciences du Vivant, Université Paris Diderot, Université de Paris, Paris, France;
\textsuperscript{b}Institut de Systématique, Évolution, Biodiversité, ISYEB - UMR 7205 – CNRS, MNHN, UPMC,
EPHE, Muséum national d’Histoire naturelle, Sorbonne Universités, Université des Antilles,
57 rue Cuvier, CP 50, Entomologie, F-75005, Paris, France;

* Corresponding author.
E-mail address: anel@mnhn.fr (A. Nel).

ABSTRACT

\textit{Pouillonphlebia burmitica} gen. et sp. nov. Ngô-Muller, Garrouste and Nel, second genus and
species of the ‘mid’-Cretaceous damsel-dragonfly family Burmaphlebiidae, is described from
the Burmese amber. This discovery suggests that this family diversified during the early
Cretaceous in the ‘Burmese’ island that detached earlier from the Gondwana and was isolated
in the Tethys Ocean at that time. We also described from the same piece of amber a small
compsocid psocodean \textit{Burmacompsocus pouilloni} sp. nov., third species belonging to this
genus, only known from the ‘mid’-Cretaceous Burmese amber. This discovery confirms that
the Compsocidae were certainly much more diverse during the Cretaceous than nowadays.

Keywords:

Odonata
1. Introduction

The ‘mid’-Cretaceous Burmese amber represents a crucial hotspot for insect palaeobiodiversity during the late Mesozoic. It is especially true for the Odonata, with no less than 21 families, 29 genera and 35 described species till 2019; and for the Psocodea (Pscoptera) with no less than nine families, 11 genera and 17 described species. The Burmese amber Odonata belong mainly to the suborder Zygoptera, even if few larger Anisoptera are recorded. The so-called ‘Anisozygoptera’, paraphyletic stem group of Anisoptera, are represented by first record of the Stenophlebiidae in amber and the monospecific family Burmaphlebiidae. These last damselfly species are especially interesting because, if the anisopteran stem group is quite diverse during the Mesozoic, there are very few fossils of this ‘group’ in amber. Here we describe the second representative of the Burmaphlebiidae as a new genus and species, also from the same Burmese amber. This Odonata is fossilized with five beetles (two Staphylinidae, a possible Byrrhoidea and two undetermined species, A. Kirejtshuk, pers. comm.), an undetermined Sciaridae, and a new species of Psocodea that we also describe in this paper (Fig. 1).

2. Materials and methods

The fossils are in a small piece of clear Burmese amber, 2.0x1.0x0.5 cm, cut, shaped, and polished. Some are well preserved while others are smashed and unidentifiable. The damselfly wings and body segments seem to be embedded across a separation between two
layers, nearly perpendicular to it, with resins of different colors and aspect at the limit. This probably indicates that it was caught first by the head and legs and half of the body before being covered by a second resin flow. The abdominal segments of the damsel-dragonfly and the Byrrhoidea are empty and filled with resin.

The specimens were examined with a Nikon SMZ 1500 and a Nikon SMZ25. Photographs were taken with a Nikon D800 digital camera mounted on the stereomicroscopes lenses; photographs were processed using the image editing software Adobe Photoshop CS. Helicon focus software was used for staking the different photographs. Line drawings of the venation were prepared directly with the aid of a camera lucida and drawn with Inkscape Software. Wing venation terminology for the Odonata follows that of Riek and Kukalová-Peck (1984), and the phylogeny is mainly based on Bechly (1996). For the Psocodea, we follow in part the catalogue of Lienhard and Smithers (2002), and the works of Smithers (1972; 1990) as essential tools for the systematic of the order. We follow the nomenclature of wing venation and body structures of Smithers (1972).

The piece of Burmese amber was collected from deposits in the Hukawng Valley (Kachin), North of Myanmar (Dong et al., 2015). The age of amber is given by radiometric analysis of zircons as earliest Cenomanian, ca. 99 Ma. (Shi et al. 2012), but it could be a little older (Mao et al., 218). This manuscript has been registered in ZooBank under the number: urn:lsid:zoobank.org:pub: xxxx

Abbreviations. Ax, primary antenodal cross vein; arc, arculus; dc, discoidal cell; sn, subnodus; C, Costa; RA, Radius anterior; RP, Radius posterior; IR, Interradius; Rspl, Radial supplement; M Median vein; MA, Media anterior; MP, Media posterior; Mspl, Median supplement; CuA, Cubitus anterior.

3. Systematic paleontology
Order: Odonata Fabricius, 1793
Suborder: Epiophlebioptera Bechly, 1996
Superfamily: Epiophlebioidea Muttkowski, 1910
Family: Burmaphlebiidae Bechly and Poinar, 2013
Type genus: Burmaphlebia Bechly and Poinar, 2013
Other genus. Pouillonphlebia gen. nov. Ngô-Muller, Garrouste and Nel

Emended diagnosis. Very small damsel-dragonfly species characterised by the following set of characters: wing length only about 13mm (autapomorphy); secondary antenodals present in both rows (plesiomorphy); arculus (arc) only slightly distal of Ax1 (autapomorphy); nodus and subnodus (sn) very oblique (autapomorphy); postnodals not aligned with subnodals (plesiomorphy); pterostigma very short (1.5 cells) (autapomorphy), but distinctly braced (plesiomorphy); discoidal cell (dc) basally closed (at least in one of the wing pairs), undivided and with acute distal angle (plesiomorphy); first branching of RP recessed midway between arculus and nodus (plesiomorphy); origin of IR2 below nodus (in Pouillonphlebia gen. nov.) or more basal between arculus and subnodus (in Burmaphlebia); RP2 originates two cells distal of nodus (autapomorphy); lestine oblique vein absent (autapomorphy); IR1 long and straight (plesiomorphy); shorter convex intercalary vein between IR1 and RP2; a longer concave and a shorter convex intercalary vein in the distal expanded area between IR2 and RP3/4; cubito-anal field not expanded and with a single row of cells (autapomorphy); wing slender and wing base only briefly stalked.

Genus Pouillonphlebia Ngô-Muller, Garrouste and Nel gen. nov.
Type species: Pouillonphlebia burmitica Ngô-Muller, Garrouste and Nel sp. nov.
Etymology. Named in honor of Dr. Jean-Marc Pouillon, who authorized us to study the type specimen, and the Greek word phleps (gen. phlebos) for vein.
**Diagnosis.** Base of IR2 slightly basal to nodal brake (autapomorphy); three antenodal crossvein of first row and two antenodal crossveins of second row distal of Ax2; base of RP2 less than one cell distal of subnodus; a complete secondary antenodal crossvein between Ax1 and Ax2.

urn:lsid:zoobank.org:pub: xxxx

**Pouillophlebia burmitica** Ngô-Muller, Garrouste and Nel sp. nov.

(Figs 2-3)

urn:lsid:zoobank.org:pub: xxxx

**Holotype.** MNHN.F.A71319 (1/8) (JMPB001 1/8, Collection Jean-Marc Pouillon), deposited in the Muséum national d’Histoire naturelle, Paris, France.

**Locality and horizon.** Burmese amber (Burmite), Lower Cretaceous, lowermost Cenomanian; Noije Bum 2001 Summit Site, Hukawng Valley, south-west of Maingkhwan in Kachin State (26°20’N, 96°36’E) in Myanmar (Burma).

**Etymology.** Named after Burma.

**Diagnosis.** As for the genus.

**Description.** The fore- and hindwing of a fossil damsel-dragonfly, with missing wing apices. Wings hyaline, maximum width of fore wing 3.6 mm; hindwing slightly broader than fore wing, maximum width 3.8 mm; venations of both wing pairs very similar; distance arculus to nodus 3.6 mm (fore wing), 3.8 mm (hindwing); distance from nodus to pterostigma 6.97 mm (hindwing); a very oblique nodal veinlet and oblique subnodus; two primary antenodal crossveins Ax1 and Ax2 with a single well aligned secondary antenodal inbetween, distance between Ax1 and Ax2 1.36 mm (fore wing), 1.27 mm (hindwing); three secondary antenodals between Ax2 and nodus in first row and two in second row; three antesubnodal crossveins between arculus and subnodus; nine postnodals and six postsubnodals in fore wing, six postnodals and five postsubnodals in hindwing, non-aligned; pterostigma not preserved, but
strongly braced; discoidal cells basally closed, free (not divided by cross veins), small, quadrangular with acute distal angle, that of hindwing slightly broader than that of fore wing; subdiscoidal cell elongate, narrow and free; arculus angulate and very close to Ax1; sectors of arculus (RP and MA) separated at origin; only a single antefurcal crossvein basal of midfork; midfork (first branching of RP) recessed slightly distal of midway between discoidal cell and nodus, distance between arculus and base of RP3/4 2.38 mm; origin of IR2 one long cell distal of RP3/4 and below subnodus; origin of RP2 one postnodal cell distal of subnodus; lestine oblique vein absent; IR1 long and straight; shorter convex intercalary vein between IR1 and RP2; a longer concave and a shorter convex intercalary vein in distal expanded area between IR2 and RP3/4; cubito-anal field not expanded and with a single row of cells. Two complete segments of abdomen (probably third and fourth) plus distal half of second and a fragment of fifth; small spines on dorsal crest and on intertegmental sutures of segments. No trace of a secondary genital abdominal apparatus on second segment (probably a female).

Discussion. Pouillonphlebia gen. nov. has nearly all the diagnostic characters of the monospecific Burmese amber family Burmaphlebiidae as defined in Bechly and Poinar (2013) (see emended diagnosis above). Only the character ‘pterostigma very short (1.5 cells long)’ is unknown in Pouillonphlebia gen. nov. Bechly and Poinar (2013) already discussed the position of Burmaphlebia and concluded that it can be placed into the Epiproctophora (‘Anisozygoptera’ + Anisoptera), and more precisely in the superfamily Epiophlebioidae. We confirm the hypothesis of these authors about the presence of a basally closed discoidal cell in both wing pairs. Pouillonphlebia gen. nov. differs from Burmaphlebia reifii Bechly and Poinar, 2013 in the base of IR2 slightly basal to nodal brake, while it is recessed midway between arculus and nodus in the later. This character of Pouillonphlebia gen. nov. is remarkable because the base of IR2 is generally much more basal in the Epiproctophora and especially in the extant Epiophlebiidae.
*Pouillonphlebia gen. nov.* has also three antenodal crossvein of first row distal of Ax2 instead of two in the later; and the base of RP2 is less than one cell distal of subnodus instead of being one postnodal cell in *Burmaphlebia reifi*. The first character is sufficient for a generic separation between *Pouillonphlebia gen. nov.* and *Burmaphlebia*.

Order: Psocodea Hennig, 1953

Suborder: Troctomorpha Roesler, 1944

Family: Compsocidae Mockford, 1967

Genus *Burmacompsocus* Nel and Waller, 2007

Type species. *Burmacompsocus perreaui* Nel and Waller, 2007; other species. *Burmacompsocus coniugans* Sroka and Nel, 2017, *Burmacompsocus pouilloni* sp. nov.

*Burmacompsocus pouilloni* Ngô-Muller, Garrouste and Nel sp. nov. (Fig. 4)

urn:lsid:zoobank.org:pub: xxxx

*Holotype.* MNHN.F.A71319 (2/8) (JMPB001 2/8, Collection Jean-Marc Pouillon, in the same piece of amber with the damsel-dragonfly, showing three legs of the same side attached to fragments of thorax; fore- and hindwings situated apart), deposited in the Muséum national d’Histoire naturelle, Paris, France.

*Locality and horizon.* Burmese amber (Burmite), Lower Cretaceous, lowermost Cenomanian; Noije Bum 2001 Summit Site, Hukawng Valley, south-west of Maingkhwan in Kachin State (26°20′N, 96°36′E) in Myanmar (Burma).

*Etymology.* Named in honor of Dr. Jean-Marc Pouillon, who authorized us to study the type specimen.
**Diagnosis.** M not fused to RP; a deep area between branches of RP (ratio distance between apices of RP1 and RP2 / distance between apex of RP2 and fork of RP = 2.75); a deep area between M2 and M3 (ratio distance between apices of M2 and M3 / distance between apex of M2 and base of M1+2 = 4.2).

**Description.** Fore wing hyaline, glabrous, micro-vestiture of membrane in form of short points, wing 1.74 mm long, 0.64 mm wide; pterostigma closed basally, not sclerotized, 0.32 mm long; areola postica 0.43 mm long, 0.12 mm wide, not joined to M by a crossvein; M not fused to Rs; nodulus present; two anal veins not fused distally.

Hindwing hyaline, 1.5 mm long; first segment of Rs absent; vein M two-branched.

All tarsi three-segmented, t1 the longest; pretarsal claw with two preapical denticles; pulvillus not visible.

**Discussion.** Because of the incompleteness of this fossil, we can only use the leg and wing venation characters to determine its affinities. Nevertheless, according to Smithers’ works (1972, 1990) on psocopteran families, *Burmacompsocus pouilloni* sp. nov. falls into the family Compsocidae due to the following diagnostic features: macropterous; tarsi three-segmented; body (preserved parts) and wings without flattened scales; fore wing venation not reduced to two parallel, partially evanescent, longitudinal veins; pterostigmal cell closed basally and not thickened or more opaque than the rest of the membrane; fore wing with a nodulus; fore wing with two anal veins; hindwing with M forked; tarsal claws with one preapical tooth, claws of each pair similar to one another. The absence of the first section of RP in hindwing and the forewing membrane with fine points excludes affinities with the extant genus *Compsocus* Banks, 1930. The fore wing anal veins not joining plus the vein M bifurcating into M1+2 and M3 would let it fall near the Burmese amber genus *Burmacompsocus* Nel and Waller, 2007 (Azar et al., 2016). *Burmacompsocus pouilloni* differs from *Burmacompsucus coniugans* in the very long branches of M. *Burmacompsocus pouilloni* is clearly more closely related to
*Burmacompsocus perreaui*, with which it shares longer branches of M. Nevertheless, *Burmacompsocus pouilloni* differs from the later in the deeper area between the branches of RP (ratio distance between apices of RP1 and RP2 / distance between apex of RP2 and fork of RP = 2.75 in *B. pouilloni* contra 2.1 in *B. perreaui*). The area between M2 and M3 is also deeper in *B. pouilloni* than in *B. perreaui*, viz. ratio distance between apices of M2 and M3 / distance between apex of M2 and base of M1+2 = 4.2 in *B. pouilloni* contra 2.5 in *B. perreaui* (compare Fig. 4 with the photograph of the type of *B. perreaui* on internet site https://mediaphoto.mnhn.fr/media/1548340289885P3qcMA6HT2KMulSm). Therefore we consider our fossil as a new species of *Burmacompsocus*.

### 4. Conclusion

*Pouillonphlebia* gen. nov. is the second taxon of this family only currently recorded from the Burmese amber. Bechly and Poinar (2013) considered that the Epiophlebioidea are Liassic; thus their presence in the ‘mid’-Cretaceous of Mynamar is not surprising. The small family Burmaphlebiidae possibly appeared and diversified during the Early Cretaceous in the Burmese island that was in the ‘middle’ of the Tethys Ocean at that time. *Burmacompsocus pouilloni* sp. nov. is the fourth accurate compsocid species in the Burmese amber, in two extinct genera, while this family comprises only two extant genera and species. It confirms that this family was much more diverse during the Cretaceous than nowadays.

### Acknowledgements

We sincerely thank two anonymous referees for their useful comments on the first version of the paper.

### References


Fig. 1. MNHN.F.A71319, general view, Byr Byrroidea, Sciar Sciaridae, Staph Staphylinidae, Psocodea. Scale bar represents 2 mm.

Fig. 2. *Pouillonphlebia burmitica* gen. et sp. nov., holotype MNHN.F.A71319 (1/8). Habitus. Scale bar represents 0.2 mm.

Fig. 3. *Pouillonphlebia burmitica* gen. et sp. nov., holotype MNHN.F.A71319 (1/8). (A) drawing of forewing; (B) drawing of hindwing. Scale bars represent 1 mm.

Fig. 4. *Burmacompsocus pouilloni* sp. nov., holotype MNHN.F.A71319 (2/8). (A) two wings with legs and thorax; (B) second hindwing; (C) hind leg. Scale bars represent 0.5 mm (A, B); 0.2 mm (C).

A ‘mid’-Cretaceous piece of Burmese amber with a new genus and two new insect species (Odonata: Burmaphlebiidae & ‘Psocoptera’: Compsocidae)

Valerie Ngô-Muller\(^a,b\), Romain Garrouste\(^b\), Jean-Marc Pouillon\(^c\), André Nel\(^b\)*

\(^a\)UFR Sciences du Vivant, Université Paris Diderot, Université de Paris, Paris, France; \(^b\)Institut de Systématique, Évolution, Biodiversité, ISYEB - UMR 7205 – CNRS, MNHN, UPMC, EPHE, Muséum national d’Histoire naturelle, Sorbonne Universités, Université des Antilles, 57 rue Cuvier, CP 50, Entomologie, F-75005, Paris, France; \(^c\)Nivolas Vermelle, France

* Corresponding author.

E-mail address: anel@mnhn.fr (A. Nel).

ABSTRACT
Pouillonphlebia burmitica gen. et sp. nov. Ngô-Muller, Garrouste and Nel, second genus and species of the ‘mid’-Cretaceous damsel-dragonfly family Burmaphlebiidae, is described from the Burmese amber. This discovery suggests that this family diversified during the early Cretaceous in the ‘Burmese’ island that detached earlier from the Gondwana and was isolated in the Tethys Ocean at that time. We also described from the same piece of amber a small compsocid psocodean Burmacompsocus pouilloni sp. nov., third species belonging to this genus, only known from the ‘mid’-Cretaceous Burmese amber. This discovery confirms that the Compsocidae were certainly much more diverse during the Cretaceous than nowadays.

Keywords:
Odonata
Psocodea
Epiproctophora
Epiophlebioptera
Troctomorpha
Myanmar

1. Introduction
The ‘mid’-Cretaceous Burmese amber represents a crucial hotspot for insect palaeobiodiversity during the late Mesozoic. It is especially true for the Odonata, with no less than 21 families, 29 genera and 35 described species till 2019; and for the Psocodea (Psocoptera) with no less than nine families, 11 genera and 17 described species. The Burmese amber Odonata belong mainly to the suborder Zygoptera, even if few larger Anisoptera are recorded. The so-called ‘Anisozygoptera’, paraphyletic stem group of Anisoptera, are represented by first record of the Stenophlebiidae in amber and the monospecific family Burmaphlebiidae. These last damsel-
dragonflies are especially interesting because, if the anisopteran stem group is quite diverse
during the Mesozoic, there are very few fossils of this ‘group’ in amber. Here we describe the
second representative of the Burmaphlebiidae as a new genus and species, also from the same
Burmese amber. This Odonata is fossilized with five beetles (two Staphylinidae, a possible
Byrrhoidea and two undetermined species, A. Kirejtshuk, pers. comm.), an undetermined
Sciaridae, and a new species of Psocodea that we also describe in this paper (Fig. 1).

2. Materials and methods

The fossils are in a small piece of clear Burmese amber, 2.0x1.0x0.5 cm, cut, shaped, and
polished. Some are well preserved while others are smashed and unidentifiable. The damsel-
dragonfly wings and body segments seem to be embedded across a separation between two
layers, nearly perpendicular to it, with resins of different colors and aspect at the limit. This
probably indicates that it was caught first by the head and legs and half of the body before being
covered by a second resin flow. The abdominal segments of the damsel-dragonfly and the
Byrrhoidea are empty and filled with resin.

The specimens were examined with a Nikon SMZ 1500 and a Nikon SMZ25. Photographs were
taken with a Nikon D800 digital camera mounted on the stereomicroscopes lenses; photographs
were processed using the image editing software Adobe Photoshop CS. Helicon focus software
was used for stacking the different photographs. Line drawings of the venation were prepared
directly with the aid of a camera lucida and drawn with Inkscape Software. Wing venation
terminology for the Odonata follows that of Riek and Kukalová-Peck (1984), and the phylogeny
is mainly based on Bechly (1996). For the Psocodea, we follow in part the catalogue of Lienhard
and Smithers (2002), and the works of Smithers (1972; 1990) as essential tools for the
systematic of the order. We follow the nomenclature of wing venation and body structures of
Smithers (1972).
The piece of Burmese amber was collected from deposits in the Hukawng Valley (Kachin), North of Myanmar (Dong et al., 2015). The age of amber is given by radiometric analysis of zircons as earliest Cenomanian, ca. 99 Ma. (Shi et al. 2012), but it could be a little older (Mao et al., 218). This manuscript has been registered in ZooBank under the number: urn:lsid:zoobank.org:pub: xxxx

Abbreviations. Ax, primary antenodal cross vein; arc, arculus; dc, discoidal cell; sn, subnodus; C, Costa; RA, Radius anterior; RP, Radius posterior; IR, Interradius; Rspl, Radial supplement; M, Median vein; MA, Media anterior; MP, Media posterior; Mspl, Median supplement; CuA, Cubitus anterior.

3. Systematic paleontology

Order: Odonata Fabricius, 1793
Suborder: Epiophlebioptera Bechly, 1996
Superfamily: Epiophlebioidea Muttkowski, 1910
Family: Burmaphlebiidae Bechly and Poinar, 2013
Type genus: Burmaphlebia Bechly and Poinar, 2013
Other genus. Pouillonphlebia gen. nov. Ngô-Muller, Garrouste and Nel

Emended diagnosis. Very small damsel-dragonfly species characterised by the following set of characters: wing length only about 13mm (autapomorphy); secondary antenodals present in both rows (plesiomorphy); arculus (arc) only slightly distal of Ax1 (autapomorphy); nodus and subnodus (sn) very oblique (autapomorphy); postnodals not aligned with subnodals (plesiomorphy); pterostigma very short (1.5 cells) (autapomorphy), but distinctly braced (plesiomorphy); discoidal cell (dc) basally closed (at least in one of the wing pairs), undivided and with acute distal angle (plesiomorphy); first branching of RP recessed midway between arculus and nodus (plesiomorphy); origin of IR2 below nodus (in Pouillonphlebia gen. nov.) or
more basal between arculus and subnodus (in *Burmaphlebia*); RP2 originates two cells distal of nodus (autapomorphy); lestine oblique vein absent (autapomorphy); IR1 long and straight (plesiomorphy); shorter convex intercalary vein between IR1 and RP2; a longer concave and a shorter convex intercalary vein in the distal expanded area between IR2 and RP3/4; cubito-anal field not expanded and with a single row of cells (autapomorphy); wing slender and wing base only briefly stalked.

Genus *Pouillonphlebia* Ngô-Muller, Garrouste and Nel gen. nov.

Type species: *Pouillonphlebia burmitica* Ngô-Muller, Garrouste and Nel sp. nov.

*Etymology.* Named in honor of Dr. Jean-Marc Pouillon, who authorized us to study the type specimen, and the Greek word phleps (gen. phlebos) for vein.

*Diagnosis.* Base of IR2 slightly basal to nodal brake (autapomorphy); three antenodal crossvein of first row and two antenodal crossveins of second row distal of Ax2; base of RP2 less than one cell distal of subnodus; a complete secondary antenodal crossvein between Ax1 and Ax2.

urn:lsid:zoobank.org:pub: xxxx

*Pouillonphlebia burmitica* Ngô-Muller, Garrouste and Nel sp. nov.

(Figs 2-3)

urn:lsid:zoobank.org:pub: xxxx

*Holotype.* MNHN.F.A71319 (1/8) (JMPB001 1/8, Collection Jean-Marc Pouillon), deposited in the Muséum national d'Histoire naturelle, Paris, France.

*Locality and horizon.* Burmese amber (Burmite), Lower Cretaceous, lowermost Cenomanian; Noije Bum 2001 Summit Site, Hukawng Valley, south-west of Maingkhwan in Kachin State (26°20'N, 96°36'E) in Myanmar (Burma).

*Etymology.* Named after Burma.
**Diagnosis.** As for the genus.

**Description.** The fore- and hindwing of a fossil damsel-dragonfly, with missing wing apices. Wings hyaline, maximum width of fore wing 3.6 mm; hindwing slightly broader than fore wing, maximum width 3.8 mm; venations of both wing pairs very similar; distance arculus to nodus 3.6 mm (fore wing), 3.8 mm (hindwing); distance from nodus to pterostigma 6.97 mm (hindwing); a very oblique nodal veinlet and oblique subnodus; two primary antenodal crossveins Ax1 and Ax2 with a single well aligned secondary antenodal inbetween, distance between Ax1 and Ax2 1.36 mm (fore wing), 1.27 mm (hindwing); three secondary antenodals between Ax2 and nodus in first row and two in second row; three antesubnodal crossveins between arculus and subnodus; nine postnodals and six postsubnodals in fore wing, six postnodals and five postsubnodals in hindwing, non-aligned; pterostigma not preserved, but strongly braced; discoidal cells basally closed, free (not divided by cross veins), small, quadrangular with acute distal angle, that of hindwing slightly broader than that of fore wing; subdiscoidal cell elongate, narrow and free; arculus angulate and very close to Ax1; sectors of arculus (RP and MA) separated at origin; only a single antefurcal crossvein basal of midfork; midfork (first branching of RP) recessed slightly distal of midway between discoidal cell and nodus, distance between arculus and base of RP3/4 2.38 mm; origin of IR2 one long cell distal of RP3/4 and below subnodus; origin of RP2 one postnodal cell distal of subnodus; lestine oblique vein absent; IR1 long and straight; shorter convex intercalary vein between IR1 and RP2; a longer concave and a shorter convex intercalary vein in distal expanded area between IR2 and RP3/4; cubito-anal field not expanded and with a single row of cells.

Two complete segments of abdomen (probably third and fourth) plus distal half of second and a fragment of fifth; small spines on dorsal crest and on intertegmental sutures of segments. No trace of a secondary genital abdominal apparatus on second segment (probably a female).
Discussion. *Pouillonphlebia* gen. nov. has nearly all the diagnostic characters of the monospecific Burmese amber family Burmaphlebiidae as defined in Bechly and Poinar (2013) (see emended diagnosis above). Only the character ‘pterostigma very short (1.5 cells long)’ is unknown in *Pouillonphlebia* gen. nov.

Bechly and Poinar (2013) already discussed the position of *Burmaphlebia* and concluded that it can be placed into the Epiproctophora (‘Anisozygoptera’ + Anisoptera), and more precisely in the superfamily Epiophlebioidea. We confirm the hypothesis of these authors about the presence of a basally closed discoidal cell in both wing pairs.

*Pouillonphlebia* gen. nov. differs from *Burmaphlebia reifi* Bechly and Poinar, 2013 in the base of IR2 slightly basal to nodal brake, while it is recessed midway between arculus and nodus in the later. This character of *Pouillonphlebia* gen. nov. is remarkable because the base of IR2 is generally much more basal in the Epiproctophora and especially in the extant Epiophlebiidae.

*Pouillonphlebia* gen. nov. has also three antenodal crossvein of first row distal of Ax2 instead of two in the later; and the base of RP2 is less than one cell distal of subnodus instead of being one postnodal cell in *Burmaphlebia reifi*. The first character is sufficient for a generic separation between *Pouillonphlebia* gen. nov. and *Burmaphlebia*.

Order: Psocodea Hennig, 1953
Suborder: Troctomorpha Roesler, 1944
Family: Compsocidae Mockford, 1967
Genus *Burmacompsocus* Nel and Waller, 2007
Type species. *Burmacompsocus perreaui* Nel and Waller, 2007; other species. *Burmacompsocus coniugans* Sroka and Nel, 2017, *Burmacompsocus pouilloni* sp. nov.

*Burmacompsocus pouilloni* Ngô-Muller, Garrouste and Nel sp. nov.
Holotype. MNHN.F.A71319 (2/8) (JMPB001 2/8, Collection Jean-Marc Pouillon, in the same piece of amber with the damsel-dragonfly, showing three legs of the same side attached to fragments of thorax; fore- and hindwings situated apart), deposited in the Muséum national d’Histoire naturelle, Paris, France.

Locality and horizon. Burmese amber (Burmite), Lower Cretaceous, lowermost Cenomanian; Noije Bum 2001 Summit Site, Hukawng Valley, south-west of Maingkhwan in Kachin State (26°20’N, 96°36’E) in Myanmar (Burma).

Etymology. Named in honor of Dr. Jean-Marc Pouillon, who authorized us to study the type specimen.

Diagnosis. M not fused to RP; a deep area between branches of RP (ratio distance between apices of RP1 and RP2 / distance between apex of RP2 and fork of RP = 2.75); a deep area between M2 and M3 (ratio distance between apices of M2 and M3 / distance between apex of M2 and base of M1+2 = 4.2).

Description. Fore wing hyaline, glabrous, micro-vestiture of membrane in form of short points, wing 1.74 mm long, 0.64 mm wide; pterostigma closed basally, not sclerotized, 0.32 mm long; areola postica 0.43 mm long, 0.12 mm wide, not joined to M by a crossvein; M not fused to Rs; nodulus present; two anal veins not fused distally.

Hindwing hyaline, 1.5 mm long; first segment of Rs absent; vein M two-branched.

All tarsi three-segmented, t1 the longest; pretarsal claw with two preapical denticles; pulvillus not visible.

Discussion. Because of the incompleteness of this fossil, we can only use the leg and wing venation characters to determine its affinities. Nevertheless, according to Smithers’ works (1972, 1990) on pscopteran families, Burmacompsocus pouilloni sp. nov. falls into the family
Compsocidae due to the following diagnostic features: macropterous; tarsi three-segmented; body (preserved parts) and wings without flattened scales; fore wing venation not reduced to two parallel, partially evanescent, longitudinal veins; pterostigmal cell closed basally and not thickened or more opaque than the rest of the membrane; fore wing with a nodulus; fore wing with two anal veins; hindwing with M forked; tarsal claws with one preapical tooth, claws of each pair similar to one another. The absence of the first section of RP in hindwing and the forewing membrane with fine points excludes affinities with the extant genus *Compsocus* Banks, 1930. The fore wing anal veins not joining plus the vein M bifurcating into M1+2 and M3 would let it fall near the Burmese amber genus *Burmacompsocus* Nel and Waller, 2007 (Azar et al., 2016). *Burmacompsocus pouilloni* differs from *Burmacompsocus coniugans* in the very long branches of M. *Burmacompsocus pouilloni* is clearly more closely related to *Burmacompsocus perreaui*, with which it shares longer branches of M. Nevertheless, *Burmacompsocus pouilloni* differs from the later in the deeper area between the branches of RP (ratio distance between apices of RP1 and RP2 / distance between apex of RP2 and fork of RP = 2.75 in *B. pouilloni* contra 2.1 in *B. perreaui*). The area between M2 and M3 is also deeper in *B. pouilloni* than in *B. perreaui*, viz. ratio distance between apices of M2 and M3 / distance between apex of M2 and base of M1+2 = 4.2 in *B. pouilloni* contra 2.5 in *B. perreaui* (compare Fig. 4 with the photograph of the type of *B. perreaui* on internet site https://mediaphoto.mnhn.fr/media/1548340289885P3qcMA6HT2KMulSm). Therefore we consider our fossil as a new species of *Burmacompsocus*.

**4. Conclusion**

*Pouillonphlebia* gen. nov. is the second taxon of this family only currently recorded from the Burmese amber. Bechly and Poinar (2013) considered that the Epiophlebioidea are Liassic; thus their presence in the ‘mid’-Cretaceous of Mynamar is not surprising. The small family
Burmaphlebiidae possibly appeared and diversified during the Early Cretaceous in the Burmese island that was in the ‘middle’ of the Tethys Ocean at that time. *Burmacompocus pouilloni* sp. nov. is the fourth accurate compsocid species in the Burmese amber, in two extinct genera, while this family comprises only two extant genera and species. It confirms that this family was much more diverse during the Cretaceous than nowadays.

**Acknowledgements**

We sincerely thank two anonymous referees for their useful comments on the first version of the paper. We thank a lot Jean-Marc Pouillon for donating the type specimen and allowing its study, and for his great help in this paper.

**References**


Fig. 1. MNHN.F.A71319, general view, Byr Byroidea, Sciar Sciaridae, Staph Staphylinidae, Psoc Psocodea. Scale bar represents 2 mm.

Fig. 2. Pouillonphlebia burmitica gen. et sp. nov., holotype MNHN.F.A71319 (1/8). Habitus. Scale bar represents 0.2 mm.

Fig. 3. Pouillonphlebia burmitica gen. et sp. nov., holotype MNHN.F.A71319 (1/8). (A) drawing of forewing; (B) drawing of hindwing. Scale bars represent 1 mm.

Fig. 4. Burmacompsocus pouilloni sp. nov., holotype MNHN.F.A71319 (2/8). (A) two wings with legs and thorax; (B) second hindwing; (C) hind leg. Scale bars represent 0.5 mm (A, B); 0.2 mm (C).