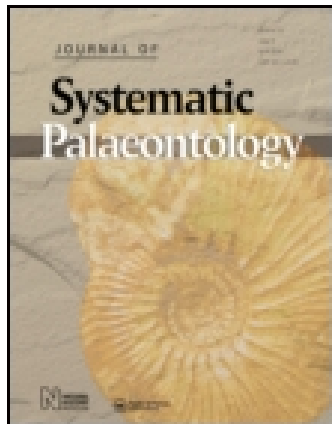


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## Journal of Systematic Palaeontology

Publication details, including instructions for authors and subscription information:  
<http://www.tandfonline.com/loi/tjsp20>

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Published online: 09 Mar 2010.

To cite this article: Michael S. Engel (2004) The Dustytwings in cretaceous Burmese amber (Insecta: Neuroptera: Coniopterygidae), *Journal of Systematic Palaeontology*, 2:2, 133-136, DOI: [10.1017/S1477201904001191](https://doi.org/10.1017/S1477201904001191)

To link to this article: <http://dx.doi.org/10.1017/S1477201904001191>

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# THE DUSTYWINGS IN CRETACEOUS BURMESE AMBER (INSECTA: NEUROPTERA: CONIOPTERYGIDAE)

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**SYNOPSIS** The dustywing fauna (Neuroptera: Coniopterygidae) of Upper Albian Burmese amber is revised. Two species are recognised, one belonging to the subfamily Aleuropteryginae and one to the Coniopteryginae. The aleuropterygine species is placed in the genus *Glaesoconis* (*Glaesoconis balipteryx* sp. nov.), a previously known fontenelleine genus from New Jersey and Siberian ambers. The apparent coniopterygine differs in several features of wing venation and is therefore placed in its own tribe: Phthanoconini nov. (*Phthanoconis burmitica* gen. et sp. nov.). A revised key to Cretaceous dustywing genera is provided.

**KEY WORDS** Aleuropteryginae, Coniopteryginae, Myanmar, Neuropterida, Planipennia, taxonomy

## INTRODUCTION

The Neuropterida (Neuroptera, Megaloptera and Raphidioptera) are one of the most distinctive and ancient of endopterygote lineages. Stem-group neuropterids occurred during the Lower Permian with putative basal members of the orders Neuroptera and Megaloptera appearing shortly thereafter and the earliest records of Raphidioptera coming from the Lower Jurassic (Lias) (Engel 2002a). Thus, by the Cretaceous and the appearance of those forests that produced the only Mesozoic, insect-bearing resins, the Neuroptera were already ancient, diverse and well-established predators in most communities. Within the Cenozoic, the Middle Eocene (Lutetian) (age reviewed in Engel 2001) amber of northern Europe preserves the most diverse neuropterid fauna, that fauna of the younger (Early Miocene) Dominican amber palling by comparison. By contrast, neuropterid representation in Cretaceous ambers has been remarkably poor, the most diverse fauna being that preserved in Turonian amber from New Jersey (Grimaldi 2000; Engel 2002b) and only scattered records from other localities. Renewed interest in Burmese amber (Zherikhin & Ross 2000), and the recovery of new material from northern Myanmar (e.g. Grimaldi *et al.* 2002), has indicated several neuropterid lineages present in this resin (Rasnitsyn & Ross 2000; Grimaldi *et al.* 2002). In fact, with the growing awareness that neuropterids are actually well represented in Burmese amber (particularly the family Berothidae; Grimaldi *et al.* 2002), it is remarkable that the first described species for the superorder was not published until early in 2002 (Engel 2002a). The first Burmese amber Neuroptera are proposed herein and a complete treatment of the Neuropterida is presently under preparation (Engel 2004; unpublished results.).

Herein is described the dustywing (Coniopterygidae) fauna of Burmese amber. Dustywings are the dwarves of the Neuroptera, most adults having forewing lengths under 6 mm. Species are predators (both as larvae and adults) preying on aphids, mealybugs, whiteflies or other minute

arthropods such as mites living on conifers and deciduous trees or shrubs (Meinander 1972). The earliest fossil of the family is *Juraconiopteryx* from the Upper Jurassic Karatau deposits in southern Kazakhstan (Meinander 1975) and, although placed in Aleuropteryginae, little is preserved so that assignment must be considered tentative. The earliest definitive members of the family are those in Lower Cretaceous amber from Lebanon (Whalley 1980; Azar *et al.* 2000; Engel 2002b). Table 1 summarises the geological and classificatory distribution of the described fossil dustywings. Two species are represented in the Burmese amber fauna. The first belongs to the subfamily Aleuropteryginae and is typical for most species characterised from other Cretaceous deposits. The second is similar to the Lebanese amber genus *Libanosemidalis* Azar *et al.* (2000) in that both are the only Mesozoic dustywings with only two medial branches (all other Cretaceous species having three medial branches). The new genus, however, differs significantly from *Libanosemidalis* and all other Coniopteryginae and is therefore placed in a new genus and tribe. The key (provided below) allows for the separation of all Cretaceous dustywing genera.

## SYSTEMATIC PALAEOLOGY

Family **CONIOPTERYGIDAE** Burmeister, 1839

Subfamily **ALEUROPTERYGINAE** Enderlein, 1905

Tribe **FONTENELLEINI** Carpentier & Lestage, 1928

Genus **GLAESOCONIS** Meinander, 1975

*Glaesoconis balipteryx* sp. nov. (Fig. 1A; see Pl. 2, figs 5 & 6)

**ETYMOLOGY.** The specific epithet is a combination of the Greek words *bali* (meaning, 'spotted') and *pteryx* (meaning 'wing').

**TYPES.** Holotype male, AMNH Bu-1560 (Fig. 1A). One paratype male, in piece with holotype (paratype situated slightly

**Table 1** Named Fossil Coniopterygidae<sup>†</sup>.

Taxa	Deposit
Family CONIOPTERYGIDAE Burmeister	
Subfamily Coniopteryginae Burmeister	
Tribe Coniopterygini Burmeister	
<i>Coniopteryx enderleini</i> Meunier <sup>§</sup>	African copal
<i>Coniopteryx timidus</i> (Hagen)	Baltic amber
† <i>Heminiphethia fritschi</i> Enderlein	Baltic amber
† <i>Libanosemidalis hammanaensis</i> Azar <i>et al.</i>	Lebanese amber
Tribe Conwentziini Enderlein	
<i>Hemisemidalis kulickae</i> Dobosz & Krzeminski	Baltic amber
<i>Hemisemidalis sharovi</i> Meinander	Baltic amber
<i>Semidalis copalina</i> Meunier <sup>§</sup>	Malagasy copal
Tribe †Phthanoconini nov.	
† <i>Phthanoconis burmitica</i> nov.	Burmese amber
Subfamily Aleuropteryginae Enderlein	
Tribe Incertae Sedis	
† <i>Archiconiocompsa prisca</i> Enderlein	Baltic amber
† <i>Juraconiopteryx zherichini</i> Meinander	Upper Jurassic, Kazakhstan
Tribe Fontenelleini Carpentier & Lestage (paraphyletic?)	
† <i>Apoglaesoconis ackermani</i> Grimaldi	New Jersey amber
† <i>Apoglaesoconis cherylae</i> Engel	New Jersey amber
† <i>Apoglaesoconis luzzii</i> Grimaldi	New Jersey amber
† <i>Apoglaesoconis swolenskyi</i> Grimaldi	New Jersey amber
† <i>Archiconis electrica</i> Enderlein	Baltic amber
† <i>Glaesoconis baliopteryx</i> nov.	Burmese amber
† <i>Glaesoconis cretica</i> Meinander	Siberian amber
† <i>Glaesoconis nearctica</i> Grimaldi	New Jersey amber
† <i>Libanoconis fadiacra</i> (Whalley)	Lebanese amber
† <i>Pararchiconis quievreuxi</i> Nel	Oligocene, France
<i>Spiloconis glaesaria</i> Meinander	Dominican amber

† Extinct genus- or family-group taxon.

† Ansonge (1996) transferred the Liassic fossil †*Archiconiopteryx lasina* (Handlirsch 1906) (see Enderlein 1909) to a separate family, Archiconiopterygidae, in the Hemiptera.

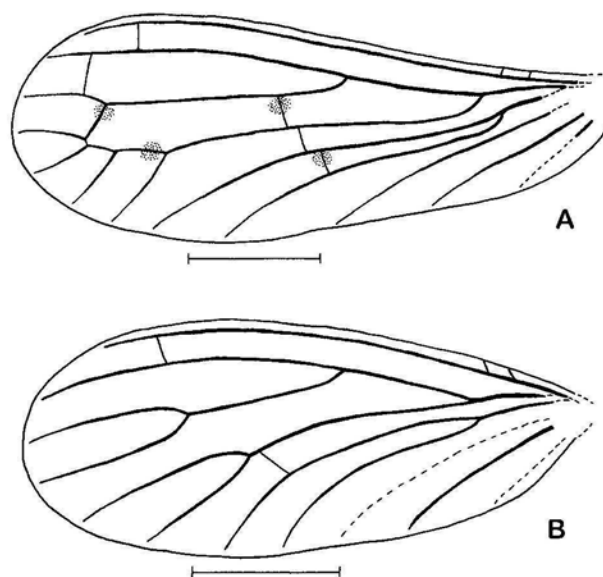
§ The two subfossil species described from copal (*Coniopteryx enderleini* and *Semidalis copalina*) are probably synonymous with extant species.

posterior to holotype). One paratype male, AMNH Bu-198 (Fig. 1B) (a photograph of this paratype also appears in Grimaldi *et al.* 2002: fig. 28a). All deposited in the amber collection of the Division of Invertebrate Zoology, American Museum of Natural History (AMNH), New York.

**OCCURRENCE.** Cretaceous amber (Upper Albian: Cruickshank & Ko 2003); Myanmar (Burma): Kachin: Tanai Village (on Ledo Rd. 105 km north-west Myitkyna).

**DIAGNOSIS.** Unlike the other species of *Glaesoconis*, the wings of the new species are distinctly spotted (pigmented areas indicated in Fig. 1A) and the distalmost r-m cross-vein (connecting R<sub>4+5</sub> to the anterior branch of M) is distinctly shorter than the basal abscissa of R<sub>4+5</sub>.

**DESCRIPTION.** Total body length 1.86 mm; fore-wing length 1.94 mm; hind-wing length 1.70 mm. Head slightly longer than wide (head width 0.32 mm, length 0.38 mm), malar space length approximately one-fourth of compound eye length; head capsule strongly sclerotised; vertex swollen;



**Figure 1** Diagram showing fore-wing venation for (A) *Glaesoconis baliopteryx* sp. nov., holotype male, AMNH Bu-1560 and (B) *Phthanoconis burmitica* gen. et sp. nov., holotype female, AMNH Bu-1291. Scale bars = 0.5 mm.

scapes well separated, scape length twice width; 25–27 flagellomeres (paratypes differ slightly in number of flagellomeres), each as wide as long except distalmost flagellomere weakly conical; maxillary palpi elongate, segments slightly longer than wide except apical segment twice as long as wide, distinctly swollen on ventral surface, with dense microscopic setae. Fore-wing slightly longer than twice width; two distinct basal cross-veins in costal area; Sc<sub>2</sub> meeting R strongly basad r-rs, r-rs striking R<sub>2+3</sub> distad of fork of R<sub>2+3</sub> – R<sub>4+5</sub>; 1r-m near wing midpoint, distad m-cu<sub>1</sub>; 2r-m short, much shorter than basal abscissa of R<sub>4+5</sub> (2r-m elongate and subequal in length to basal abscissa R<sub>4+5</sub> in *G. nearctica* Grimaldi and *G. cretica* Meinander); M lacking setae positioned on vein thickenings, M with three branches, first branch (i.e. posterior branch) in distal third of wing; m-cu<sub>1</sub> distad cu<sub>1</sub>-cu<sub>2</sub>; marginal fringes minute; membrane hyaline except for four distinct fuscous spots, first spot on anterior two-thirds of 1r-m where cross-vein joins R, second spot on basal abscissa of R<sub>4+5</sub> near R<sub>2+3</sub> – R<sub>4+5</sub> fork, third spot on M just distad separation of posterior branch, fourth spot on cu<sub>1</sub>-cu<sub>2</sub> (paratypes exhibit identical pattern of spots); additional venational details depicted in Fig. 1A. Hind-wing as in other *Glaesoconis* species except 2r-m shortened. Integument generally minutely imbricate, dark brown, with sparse minute setae.

**REMARKS.** The fossil is easily placed in *Glaesoconis* by the possession of more than 20 flagellomeres, three branches in the fore-wing media, the branching of the media strongly distad of the basal r-m cross-vein and the absence of setae proximally on the media. Overall, the species is remarkably similar to other *Glaesoconis*. In paratype Bu-198 the first abscissa of Sc<sub>2</sub> and m-cu are extremely faint and, when first examined, believed to be absent until more careful investigation revealed them to indeed be present. Similarly, in the holotype the distal, fuscous spot on the basal abscissa of R<sub>4+5</sub> is faint while in the paratypes it is quite strong.

Subfamily **CONIOPTERYGINAE** Burmeister, 1839  
Tribe **PHTHANOCONINI** nov.

TYPE GENUS. *Phthanoconis* gen. nov.

DIAGNOSIS. Fore-wing media two-branched; however, entirely lacking r-m cross-veins (in this one trait differing from all other members of the family). Unlike most aleuropterygines, *Phthanoconis* lacks seta-bearing thickenings on the medial stem and lacks sternal plicaturae. Within Coniopteryginae, *Phthanoconis* differs from all members by the complete absence of r-m cross-veins.

COMMENTS. Phthanoconini is like *Libanosemidalis* and Aleuropteryginae in the origination of Rs near the wing base in the hind-wing. The complete separation of R<sub>4+5</sub> from the anterior branch of M is similar to Coniocompsini; however, the aforementioned characters (e.g. the absence of abdominal plicaturae as in Coniopteryginae) preclude assignment to Aleuropteryginae. The key (provided below) allows for the separation of all Cretaceous dustywing genera.

Genus **PHTHANOCONIS** nov.

ETYMOLOGY. The new genus-group name is a combination of the Greek words *phthano* (meaning 'come before') and *konis* (*konis* or *konios*, meaning 'dust'), a suffix typical of many dustywing genera. The name is feminine.

TYPE SPECIES. *Phthanoconis burmitica* gen. et sp. nov.

DIAGNOSIS. As for the tribe (see above).

***Phthanoconis burmitica*** gen. et sp. nov. (Fig. 1B; see Pl. 2, fig. 7)

ETYMOLOGY. The specific epithet is derived from 'burmite', a name for Burmese amber.

TYPES. Holotype: female, AMNH Bu-1291. Deposited in the amber collection of the Division of Invertebrate Zoology, American Museum of Natural History, New York.

DIAGNOSIS. As for the tribe (see above).

OCCURRENCE. Cretaceous (Upper Albian: Cruickshank & Ko 2003) amber; Myanmar (Burma): Kachin: Tanai Village (on Ledo Rd. 105 km north-west Myitkyna).

DESCRIPTION. Total body length 1.30 mm; fore-wing length 1.64 mm; hind-wing length 1.44 mm. Head apparently as long as wide (complete frontal view of head not possible); head capsule strongly sclerotised; vertex strongly swollen; scapes well separated, scape only very slightly longer than wide; 17 flagellomeres, each as wide as long except distalmost flagellomere weakly conical and basal five flagellomeres each longer than wide; mouthparts as described for *G. baliopteryx* (see above). Fore-wing slightly longer than twice width; two distinct basal cross-veins in costal area; Sc<sub>2</sub> meeting R slightly beyond two-thirds of wing length (i.e. distant from wing apex); R + Sc<sub>2</sub> not curving to meet Sc<sub>1</sub> in fore- or hind-wing; r-rs absent; r-m absent; R<sub>2+3</sub> — R<sub>4+5</sub> fork near point of origination of Sc<sub>2</sub> such that R<sub>2+3</sub> and R<sub>4+5</sub> are quite long; M lacking setae positioned on vein thickenings, M with two branches, separation slightly proximad R<sub>2+3</sub> — R<sub>4+5</sub> separation; m-cu<sub>1</sub> slightly proximad to fork in M; cu<sub>1</sub>-cu<sub>2</sub> absent; marginal fringes absent; membrane hyaline; additional

venational details depicted in Fig. 1B. Integument generally minutely imbricate, dark brown, with sparse minute setae.

KEY TO CRETACEOUS GENERA OF  
CONIOPTERYGIDAE

(Modified from Engel 2002b)

1. Media in fore-wing with three branches ..... 2  
— Media in fore-wing with two branches ..... 4
2. Fore-Wing without stiff setae proximally on media .... 3  
— Fore-Wing with two stiff setae situated on thickenings of media (Late Cretaceous) ..... *Apoglaesoconis* Grimaldi
3. Antennae with 25 or more flagellomeres (25–30 where known); R<sub>4</sub> + 5 distinctly angling anteriorly at distalmost r-m cross-vein; media branching strongly distad of basal r-m cross-vein (Early–Late Cretaceous) .....  
..... *Glaesoconis* Meinander  
— Antennae with less than 20 flagellomeres; R<sub>4</sub> + 5 not angling anteriorly at distalmost r-m cross-vein, instead continuing straight to wing margin; media branching at basal r-m cross-vein (Early Cretaceous) .....  
..... *Libanoconis* Engel
4. Cross-veins sc + r-rs, r-m and cu<sub>1</sub>-cu<sub>2</sub> present; R<sub>4+5</sub> connected to M<sub>1+2</sub>; cross-vein m-cu<sub>1</sub> strongly basad bifurcation of M; 24 flagellomeres (Early Cretaceous) .....  
..... *Libanosemidalis* Azar *et al.*  
— Cross-veins sc + r-rs, r-m and cu<sub>1</sub>-cu<sub>2</sub> absent; R<sub>4+5</sub> not connected to M<sub>1+2</sub>; cross-vein m-cu<sub>1</sub> near bifurcation of M; 17 flagellomeres (Early Cretaceous) .....  
..... *Phthanoconis* gen. nov.

ACKNOWLEDGEMENTS

I am grateful to D. A. Grimaldi for bringing to my attention the fossils considered herein, to A. J. Ross for inviting me to contribute to this special issue on Burmese amber and to A. J. Ross and an anonymous reviewer for comments on the manuscript. Partial support for this work was provided by a Kansas Technology Enterprise Corporation/Kansas NSF EPSCoR grant (KAN29503 to MSE) and NSF grant DBI-9987372 (to D. A. Grimaldi, AMNH). This is contribution Nr. 3333 of the Division of Entomology, Natural History Museum and Biodiversity Research Center, University of Kansas.

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