

## Short communication

## New angarosphecoid wasp (Hymenoptera: Apoidea, Angarosphecidae) from the mid-Cretaceous Burmese amber

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## ABSTRACT

A new genus and species of the family Angarosphecidae, *Decasphech cretacicus* gen. et sp. nov., from the mid-Cretaceous Burmese amber is described and illustrated. The new genus and species is most similar to *Burmasphech* Melo et Rosa, 2018 and can be easily distinguished in having female antenna 10-segmented (vs. 12-segmented), mesosoma more elongate, forewing with cell 2cu<sub>a</sub> lower, and metasomal segments 1–3 not separated with deep constrictions. Ten-segmented female antenna is a novel morphotype example of the morphological diversity of Apoidea. A key to genera of the Angarosphecidae is provided.

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## 1. Introduction

Angarosphecidae, an extinct family of aculeate wasps, was introduced to harbor an Early Cretaceous fossil *Angarosphech myrmicompterus* Rasnitsyn, 1975 from the Lagerstätte Baissa in Transbaikalia, East Siberia (Rasnitsyn, 1975). Initially questionably attributed to superfamily Scoliidae, *Angarosphech* was later appreciated as representing basal sphecoid (apoid in current terms) wasps and was attributed to Sphecidae s.l. (currently Apoidea: Spheciformes) along with several other Early Cretaceous wasp fossils, and the name Angarosphecidae was synonymized under Sphecidae (Rasnitsyn, 1980). Later on (Rasnitsyn et al., 1999) the name was restored in form of Angarosphecinae, a subfamily of Sphecidae s.l., to encompass a majority of Early Cretaceous aculeate wasps known by that time including the former family Baissodidae. As a full family, Angarosphecidae re-appears only recently

(Archibald et al., 2018; Melo et Rosa, 2018; Zhang et al., 2018a,b). By now, the family comprises 50 species in 15 genera (including those described herein) known from the lowest Cretaceous (Berriasian) till lowest Eocene in Eurasia from England and Spain to China and East Siberia, western North America, southern Africa and an isolated West Burma Block in the midst of mid-Cretaceous Tethys ocean (Table 1 and references therein; see Brothers, Rasnitsyn, 2003 for undescribed African material; for the latest catalogue see Pulawski, 2020). Comparing the latter source, *Baissodes grabaui* Ren, 1995 (in Ren et al., 1995) is excluded from Angarosphecidae now because the form and position of its metasomal base is indicative of Praeaulacidae rather than Angarosphecidae.

Delimitation of Angarosphecidae in its currently rather wide concept is not straightforward. They differ easily from the main spheciform families Sphecidae and Crabronidae in having well developed notauli as well as in cells 2rm (second submarginal) and 1mcu (first discoidal) scarcely or not at all overlapping, but these do not work with Ampulicidae (Heterogynaidae are totally different with their small size and highly modified wing venation). As a result, we have currently the only apparently reliable character diagnostic of Angarosphecidae as described by Zhang et al. (2018a). All Apoidea other than Angarosphecidae have their pronotum immovable, with hind pronotal margin thick and fit into a groove

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**Table 1**  
Fossil genera and species currently assigned to the family Ampulicidae.

| Horizon                                   | Locality                        | Taxon                                                                                     | Gender | Reference                                          |
|-------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------|--------|----------------------------------------------------|
| Lower Cretaceous, Laiyang Fm.             | Beipozi (China)                 | <i>Angarosphex beiboziensis</i> (Hong, 1984)                                              | ?      | Q. Zhang et al. (2018a)                            |
| Lower Cretaceous, lower Weald Clay        | Clockhouse Brickworks (England) | <i>Angarosphex bleachi</i> Rasnitsyn et Jarzembowski, in Rasnitsyn et al., 1998           | ?      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, lower Weald Clay        | Clockhouse Brickworks (England) | <i>Angarosphex consensus</i> Rasnitsyn et Jarzembowski, in Rasnitsyn et al., 1998         | ?      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, upper Weald Clay        | Auclaye Brickworks (England)    | <i>Angarosphex goldringi</i> Jarzembowski, 1991                                           | ?      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, Laiyang Fm.             | Tuanwang (China)                | <i>Angarosphex lithodes</i> (Zhang, 1985)                                                 | ?      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, Berriasian –Valanginian | La Cabrúa (Spain)               | <i>Angarosphex lithographicus</i> Rasnitsyn et Ansoerge, 2000                             | ♂      | Rasnitsyn and Ansoerge (2000)                      |
| Lower Cretaceous, Santana Fm.             | Nova Olinda (Brazil)            | <i>Angarosphex magnus</i> (Darling, 1990)                                                 | ♀      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, Zaza Fm.                | Baissa (Russia)                 | <i>Angarosphex myrmicopterus</i> Rasnitsyn, 1975                                          | ?      | Rasnitsyn (1975)                                   |
| Lower Cretaceous, Turga Fm.               | Turga (Russia)                  | <i>Angarosphex niger</i> Rasnitsyn, 1990                                                  | ?      | Rasnitsyn (1990)                                   |
| Lower Cretaceous, Gurvan-Ereniy-Nuru Fm.  | Gurvan-Ereniy-Nuru (Mongolia)   | <i>Angarosphex pallidus</i> Rasnitsyn, 1986                                               | ♀      | Rasnitsyn (1986)                                   |
| Lower Cretaceous, Santana Fm.             | Nova Olinda (Brazil)            | <i>Angarosphex parvus</i> (Darling, 1990)                                                 | ♀      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, Berriasian –Valanginian | Pedrera de Rúbies (Spain)       | <i>Angarosphex penyalveri</i> Rasnitsyn et Martínez-Delclòs, 2000                         | ?      | Rasnitsyn and Martínez-Delclòs (2000)              |
| Lower Cretaceous, Laiyan Fm.              | Huangbanjigou (China)           | <i>Angarosphex saxosus</i> Q. Zhang, Rasnitsyn, et H. Zhang, 2018                         | ♀      | Q. Zhang et al. (2018a)                            |
| Lower Cretaceous, Laiyan Fm.              | Nanlighezhuang (China)          | <i>Angarosphex strigosus</i> (J.F. Zhang, 1992)                                           | ♀      | Q. Zhang et al. (2018a)                            |
| Lower Cretaceous, Laiyan Fm.              | Tuanwang (China)                | <i>Angarosphex venulosus</i> (J.F. Zhang, 1985)                                           | ?      | Q. Zhang et al. (2018a)                            |
| Lower Cretaceous, lower Weald Clay        | Clockhouse Brickworks (England) | <i>Archisphech boothi</i> Jarzembowski, 1991                                              | ?      | Jarzembowski (1991)                                |
| Lower Cretaceous, Berriasian –Valanginian | La Cabrúa (Spain)               | <i>Archisphech catalunicus</i> (Ansoerge, 1993)                                           | ?      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, lower Weald Clay        | Wadhurst Clay (England)         | <i>Archisphech crowsoni</i> Evans, 1969                                                   | ?      | Evans (1969)                                       |
| Lower Cretaceous, upper Weald Clay        | Auclaye Brickworks (England)    | <i>Archisphech curvus</i> Rasnitsyn et Jarzembowski, in Rasnitsyn et al., 1998            | ?      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, lower Weald Clay        | Clockhouse Brickworks (England) | <i>Archisphech proximus</i> Rasnitsyn et Jarzembowski, in Rasnitsyn et al., 1998          | ?      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, Gurvan-Ereniy-Nuru Fm.  | Gurvan-Ereniy -Nuru (Mongolia)  | <i>Baissodes? longus</i> Rasnitsyn, 1990                                                  | ♂      | Rasnitsyn (1990)                                   |
| Lower Cretaceous, Zaza Fm.                | Baissa (Russia)                 | <i>Baissodes magnus</i> Rasnitsyn, 1975                                                   | ?      | Rasnitsyn (1975)                                   |
| Lower Cretaceous, Zaza Fm.                | Baissa (Russia)                 | <i>Baissodes robustus</i> Rasnitsyn, 1975                                                 | ♀      | Rasnitsyn (1975)                                   |
| Lower Cretaceous, lower Weald Clay        | Clockhouse Brickworks (England) | <i>Baissodes? sp.</i>                                                                     | ?      | Rasnitsyn et al. (1998)                            |
| mid-Cretaceous                            | Hukawng Valley (Myanmar)        | <i>Burmasphex pilosus</i> Melo et Rosa, 2018                                              | ♂      | Melo and Rosa (2018)                               |
| mid-Cretaceous                            | Hukawng Valley (Myanmar)        | <i>Burmasphex sulcatus</i> Melo et Rosa, 2018                                             | ♂      | Melo and Rosa (2018)                               |
| Lower Cretaceous, Khurilt Fm.             | Bon Tsagan (Mongolia)           | <i>Cretobestiola communis</i> (Pulawski et Rasnitsyn, in Rasnitsyn et al., 1999)          | ♀      | Pulawski et al., 1999/Pulawski and Rasnitsyn, 2000 |
| Lower Cretaceous, Berriasian-Valanginian  | La Pedrera de Meia (Spain)      | <i>Cretobestiola hispanica</i> (Martínez-Delclòs et Rasnitsyn, in Rasnitsyn et al., 1999) | ♂      | Pulawski et al., 1999/Pulawski and Rasnitsyn, 2000 |
| Lower Cretaceous, Khurilt Fm.             | Bon Tsagan (Mongolia)           | <i>Cretobestiola subpetiolata</i> (Pulawski et Rasnitsyn, in Rasnitsyn et al., 1999)      | ?      | Pulawski et al., 1999/Pulawski and Rasnitsyn, 2000 |
| Lower Cretaceous, Zaza Fm.                | Baissa (Russia)                 | <i>Cretobestiola tenuipes</i> (Pulawski et Rasnitsyn, in Rasnitsyn et al., 1999)          | ♂      | Pulawski et al., 1999/Pulawski and Rasnitsyn, 2000 |
| Lower Cretaceous, Khurilt Fm.             | Bon Tsagan (Mongolia)           | <i>Cretosphechium lobatum</i> Pulawski et Rasnitsyn, in Pulawski et al., 2000             | ?      | Pulawski et al. (2000)                             |
| Lower Cretaceous, Khurilt Fm.             | Bon Tsagan (Mongolia)           | <i>Cretosphechium triste</i> Pulawski et Rasnitsyn, in Pulawski et al., 2000              | ?      | Pulawski et al. (2000)                             |
| Lower Cretaceous, Zaza Fm.                | Baissa (Russia)                 | <i>Cretosphech incertus</i> Rasnitsyn, 1975                                               | ?      | Rasnitsyn (1975)                                   |
| mid-Cretaceous                            | Hukawng Valley (Myanmar)        | <i>Decasphech cretacicus</i> gen. et sp. nov.                                             | ♀      | This paper                                         |
| lower Eocene                              | Quilchena (Canada)              | <i>Eosphechium naumanni</i> Brothers et Archibald, in Pulawski et al., 2000               | ?      | Pulawski et al. (2000)                             |
| Lower Cretaceous, Laiyang Fm.             | Nanlighezhuang (China)          | <i>Eubaisodes completus</i> Zhang, 1992                                                   | ♀      | Zhang (1992)                                       |
| Lower Cretaceous, Berriasian –Valanginian | La Pedrera de Méia (Spain)      | <i>Ilerdosphech wenzae</i> Rasnitsyn, 2000                                                | ♂      | Rasnitsyn (2000)                                   |
| Lower Cretaceous, Berriasian –Valanginian | La Pedrera de Rúbies (Spain)    | <i>Montescosphech jarzembowskii</i> Rasnitsyn et Martínez-Delclòs, 2000                   | ♂?     | Rasnitsyn and Martínez-Delclòs (2000)              |
| Lower Cretaceous, Zaza Fm.                | Baissa (Russia)                 | <i>Oryctobaisodes armatus</i> Rasnitsyn, 1975                                             | ?      | Rasnitsyn (1975)                                   |
| Lower Cretaceous, Zaza Fm.                | Baissa (Russia)                 | <i>Pompilopter ciliatus</i> Rasnitsyn, 1975                                               | ?      | Rasnitsyn (1975)                                   |
| Lower Cretaceous, upper Weald Clay        | Rudgwick Brickworks (England)   | <i>Pompilopter corpus</i> Rasnitsyn et Jarzembowski, 1998                                 | ?      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, Lulworth Fm.            | Swanage (England)               | <i>Pompilopter? difficilis</i> Rasnitsyn et Jarzembowski, in Rasnitsyn et al., 1998       | ?      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, lower Weald Clay        | Burgess Hill (England)          | <i>Pompilopter keymerensis</i> Rasnitsyn et Jarzembowski, in Rasnitsyn et al., 1998       | ?      | Rasnitsyn et al. (1998)                            |
| Lower Cretaceous, lower Weald Clay        | Clockhouse Brickwork (England)  | <i>Pompilopter? leei</i> Rasnitsyn et Jarzembowski, in Rasnitsyn et al., 1998             | ?      | Rasnitsyn et al. (1998)                            |

Table 1 (continued)

| Horizon                                      | Locality                          | Taxon                                                                                                | Gender | Reference                                             |
|----------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------|
| Lower Cretaceous, Berriasian<br>–Valanginian | La Pedrera de Méia<br>(Spain)     | <i>Pompilopterus montsecensis</i> <a href="#">Rasnitsyn, 2000</a>                                    | ♀      | <a href="#">Rasnitsyn (2000)</a>                      |
| Lower Cretaceous, Berriasian<br>–Valanginian | La Cabrúa (Spain)                 | <i>Pompilopterus? noguerensis</i> <a href="#">Rasnitsyn et Martínez-Delclòs, 2000</a>                | ?      | <a href="#">Rasnitsyn and Martínez-Delclòs (2000)</a> |
| Lower Cretaceous, Lulworth Fm.               | Swanage (England)                 | <i>Pompilopterus wimbledoni</i> <a href="#">Rasnitsyn et Jarzembowski, in Rasnitsyn et al., 1998</a> | ?      | <a href="#">Rasnitsyn et al. (1998)</a>               |
| Lower Cretaceous, lower Weald<br>Clay        | Clockhouse Brickwork<br>(England) | <i>Pompilopterus? worssami</i> <a href="#">Rasnitsyn et Jarzembowski, in Rasnitsyn et al., 1998</a>  | ?      | <a href="#">Rasnitsyn et al. (1998)</a>               |
| Lower Cretaceous, Zaza Fm.                   | Baissa (Russia)                   | <i>Trichobaissodes antennatus</i>                                                                    | ♀      | <a href="#">Rasnitsyn (1975)</a>                      |
| Lower Cretaceous, Zaza Fm.                   | Baissa (Russia)                   | <i>Vitimosphex incompletus</i> <a href="#">Rasnitsyn, 1975</a>                                       | ?      | <a href="#">Rasnitsyn (1975)</a>                      |
| Lower Cretaceous, Yixian<br>Formation        | Liutaogou (China)                 | <i>Vitimosphex vividus</i> Q. Zhang, Rasnitsyn, et H. Zhang, 2018                                    | ♀      | <a href="#">Zhang et al. (2018a)</a>                  |

between scutum and prescutum of mesonotum, so as prescutum is never visible externally. Unlike that, Angarosphecidae have hind pronotal margin thin and possible to slide to-and-fro over meso-prescutum which is often visible at least in part ([Zhang et al., 2018a](#), p. 742, fig. 9; cf. also [Pulawski et al., 2000](#), fig. 1; see also [Fig. 1A, 3A](#) below). This character state is putatively plesiomorphic in Apoidea because it is characteristic of Aculeata other than Apoidea as well as of Hymenoptera in general. This attests Angarosphecidae as explicitly paraphyletic. Unfortunately we are aware of no way to split the group into all monophyletic taxa yet and so we have to operate with the family as it is until a better solution is found.

Herein, we describe and illustrate a new angarosphecid, *Decasphex cretacicus* gen. et sp. nov., in mid-Cretaceous Burmese amber from Myanmar based on a well preserved fossil specimen ([Fig. 1](#)). The new taxon is attributed to Angarosphecidae based on the above described structure of pro- and mesonotum. This new genus and

new species is unique in the family in having antenna 10-segmented and pronotum neck-like (very long and narrow). It provides a new insight into the exotic world of an isolated mid-ocean terrain of West Burma Block during mid-Cretaceous.

## 2. Material and methods

The present study is based on one female specimen, collected from the Hukawng Valley of Kachin State, Myanmar (26°20'N, 96°36'E; for locality map see [Li et al., 2018](#): fig. 1). This specimen LYHY-013 was preserved in a yellow and almost transparent Burmese amber piece (about 2.32 mm in maximum length, 1.21 mm in maximum width and 0.35 mm in maximum thickness), housed in the Institute of Geology and Paleontology, Linyi University. This amber piece with three-dimensional preservation of organisms usually provides more morphological details than rock fossils. The

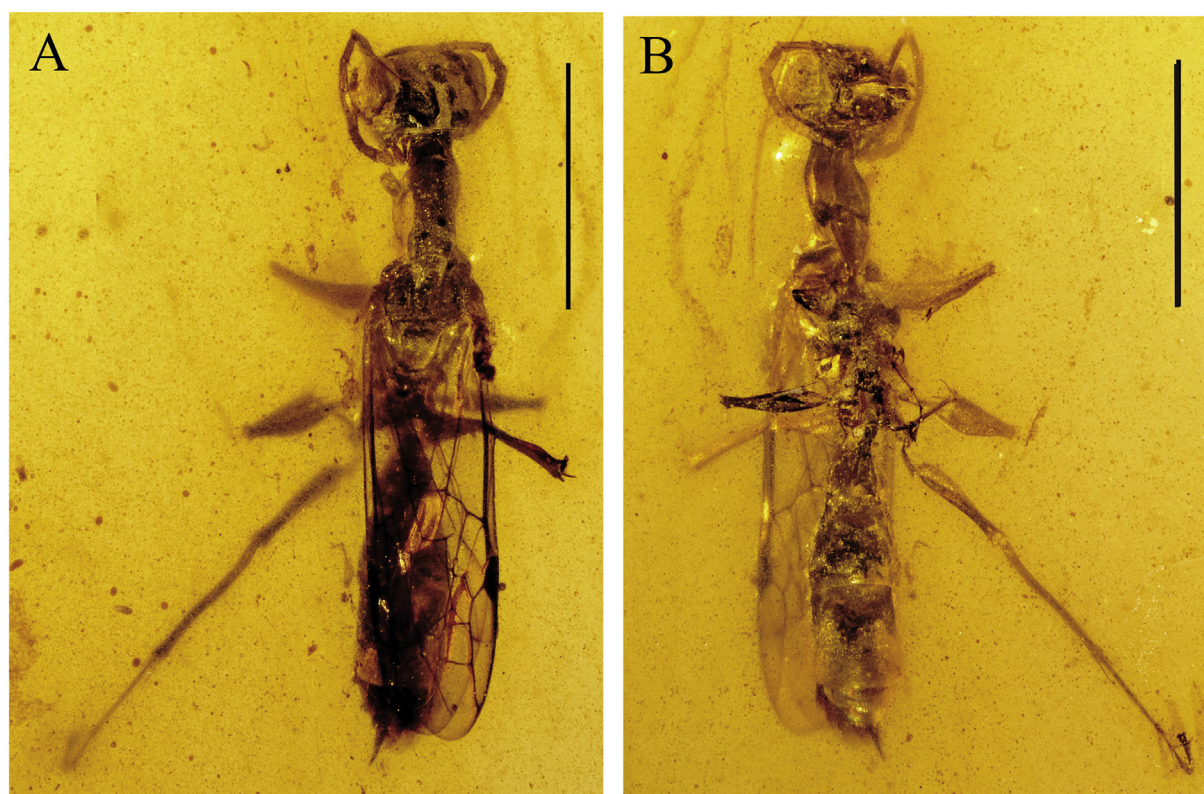


Fig. 1. Photographs of holotype of *Decasphex cretacicus* gen. et sp. nov. (LYHY-013), habitus. (A), dorsal view; (B), ventral view. Scale bars = 1.0 mm.

age of Burmese amber is now considered informally as mid-Cretaceous (amberiferous deposits are dated radiometrically by as Shi et al., 2012 as earliest Cenomanian;  $98.79 \pm 0.62$  Ma; however, the possibility of redeposition, at least partial, from slightly older deposits cannot be excluded: cf. Rasnitsyn and Öhm-Kühnle, 2020).

In order to have a better views and show more details, the amber piece was re-cut and polished as possible as flat with surfaces parallel to inclusion. The precision diamond-wire saw (GEOTOME DUAL, France) and rotary polisher (Mecatech 33, France) were prepared for this study. The specimen was checked and photomicrographed by a Nikon SMZ-10R stereoscopic microscope and VHX 5000 digital microscope platform, with incident and transmitted light used simultaneously. Helicon Focus Pro\_64 was used to stack photos for better depth of field. Illustrations of the line drawings were prepared with CorelDraw X7 and Adobe Photoshop CS6. Measurements were made with software Image J. The morphological terminology herein (Fig. 3) is largely based on Rasnitsyn (1980). All taxonomic acts established in the present work have been registered in ZooBank (see below), together with the electronic publication LSID: urn:lsid:zoo-bank.org:pub:2D88EEBF-F64B-4CF5-89B0-8E82053D58A1

### 3. Systematic palaeontology

Order Hymenoptera Linné, 1758

Superfamily Apoidea Latreille, 1802

Family Angarosphecidae Rasnitsyn, 1975

Type genus: *Angarosphe* Rasnitsyn, 1975

For composition of the family see Table 1

Key to genera of Angarosphecidae based on fore wing venation.

1. Cell 3r (marginal) ended acutely at wing margin .....2
  - Cell 3r rounded or truncate at apex .....11
2. Cells 2rm (2nd submarginal) and 1mcu (1st discoidal) well overlapping (for more than half 2-RS length) .....*Pompilopterus* Rasnitsyn, 1975
  - Cells 2rm and 1mcu overlapping scarcely (at most for less than half 2-RS length) or not at all .....3
3. Crossvein 2m-cu (2nd recurrent) entering cell 2rm .....4
  - Crossvein 2m-cu entering cell 3rm or coinciding with 2r-m .....5
4. Cell 3rm much longer on RS than on M and reaching close to 3r apex (for less than half of 3r-m length) .....*Cretobestiola* Rasnitsyn et Pulawski, 2000
  - Cell 3rm on RS not longer than on M and distant from 3r apex for 3r-m length or more .....*Archisphe* Evans, 1969
- 5 (3). Cell 2rm petiolate (2r-m meeting RS before 2r-rs) .....*Ilerdosphe* Rastitsyn, 2000
  - Cell 2rm not petiolate .....6
6. Crossvein 2m-cu meeting M equidistant of 2r-m and 3r-m .....7
  - Crossvein 2m-cu meeting M distinctly closer to 2r-m than to 3r-m .....8
7. Cell 2cua lower (shorter transversally to wing axis) than 1mcu .....*Decasphe* gen. nov.
  - Cell 2cua higher (longer transversally to wing axis) than 1mcu .....*Burmasphe* Melo et Rosa, 2018
- 8 (6). Crossvein cu-a distinctly antefurcal (meeting M+Cu before its bifurcation) .....*Angarosphe* Rasnitsyn, 1975
  - Crossvein cu-a interstitial (meeting at M+Cu bifurcation) or nearly so .....9
9. Crossvein 2r-m distinctly basal of 2m-cu .....*Baissodes* Rasnitsyn, 1975
  - Crossveins 2r-m and 2m-cu coincide or nearly so .....10

10. Crossvein 3r-m strongly oblique to wing axis, more or less sinuate .....*Cretosphe* Rasnitsyn, 1975
  - Crossvein 3r-m at most scarcely oblique, straight .....*Montsecosphe* Rasnitsyn et Martínez-Delclòs, 2000
- 11 (1). Apex of cell 3r rounded, with no free end of R away of wing margin .....12
  - Cell 3r with free R end away of wing margin .....14
12. Cells 2rm and 1mcu scarcely overlapping, 3-RS a fraction of 2r-rs .....*Trichobaissodes* Rasnitsyn, 1975
  - Cells 2rm and 1mcu well overlapping, 3-RS several times as long as 2r-rs .....13
13. Crossvein 3r-m near apex of cell 3r, 1m-cu near middle of cell 2rm .....*Cretosphe* Pulawski et Rasnitsyn, 1999
  - Crossvein 3r-m before apex of cell 3r for at least half of 3r-m length, 1m-cu well before middle of cell 2rm .....*Eosphe* Pulawski et Rasnitsyn, 1999
- 14 (11). Cell 3r truncated .....*Oryctobaissodes* Rasnitsyn, 1975
  - Cell 3r rounded .....*Vitimosphe* Rasnitsyn, 1975

Genus *Decasphe* Zheng, Zhang et Rasnitsyn, gen. nov.

(LSID: urn:lsid:zoobank.org:act:751C7D93-1242-4A07-A98B-1A2807DA510B)

Type species: *K. cretacicus* Zheng, Zhang et Rasnitsyn, sp. nov.

**Diagnosis.** Female. Antenna 10-segmented, with scape elongate. Mandibles with two vertically arranged apical sharp teeth of equal length and with massive sharp inner subapical tooth. Pronotum neck-like long and narrow, with no visible carination, with hind margin thin, apparently sliding over smooth mesonotal prescutum to open prescutum partially, with posterior lobe almost reaching tegula. Mesonotum with prescutum long, delimited from scutum with distinct line (not deep furrow), with notauli deep, percurrent. Legs slender, coxae elongate, mid ones wide separated by metasternum leveled with ventropleuron, hind coxa scarcely separated, femora incrassate basal, tibiae not spinose, with spurs 1-2-2, claws with preapical tooth. Forewing 2-RS bent, with no 1r-rs rudiment, cell 3r with acute apex touching wing margin, 2-M slightly shorter than 1-RS+M, 3rm distant from apex of 3r, 1m-cu slightly basal of RS+M bifurcation, 2m-cu at midlength of cell 3rm, cu-a shortly before apex of M+Cu, cells 1mcu and 2cua similar in height. Metasoma with heteronomous segmentation: terga 1-3 of subequal length and more than twice as long as any of following ones and with no pronounced constriction between segments 1-3.

**Remarks.** *Decasphe* gen. nov. differs from all Angarosphecidae as well as from all Apoidea and vast majority of non-chrisidoid Aculeata in having female antenna 10-segment and not 12-segmented. Otherwise it is similar to *Burmasphe* Melo et Rosa in general appearance of body (big head and slim, elongate mesosoma) and wings, and more specifically in tridentate mandible with vertically arranged apical pair and in heteronomous segmentation of metasoma. *Decasphe* differs from *Burmasphe*, besides 10-segmented antenna, in having more elongate pronotum, metasoma lacking deep constrictions between metasomal segments 1-3, and in cell 2cua not being much higher than 1mcu. For differences from other angarosphecid genera in wing venation see key above.

**Etymology.** The generic name is based on the Greek words 'deca' meaning ten and the 'sphe' meaning wasp. The gender is masculine.

*Decasphe cretacicus* Zheng, Zhang et Rasnitsyn, sp. nov.

(LSID: urn:lsid:zoobank.org:act:961ED993-AEBC-4822-BC5B-D1BA3A590F46)

Figs.1-3

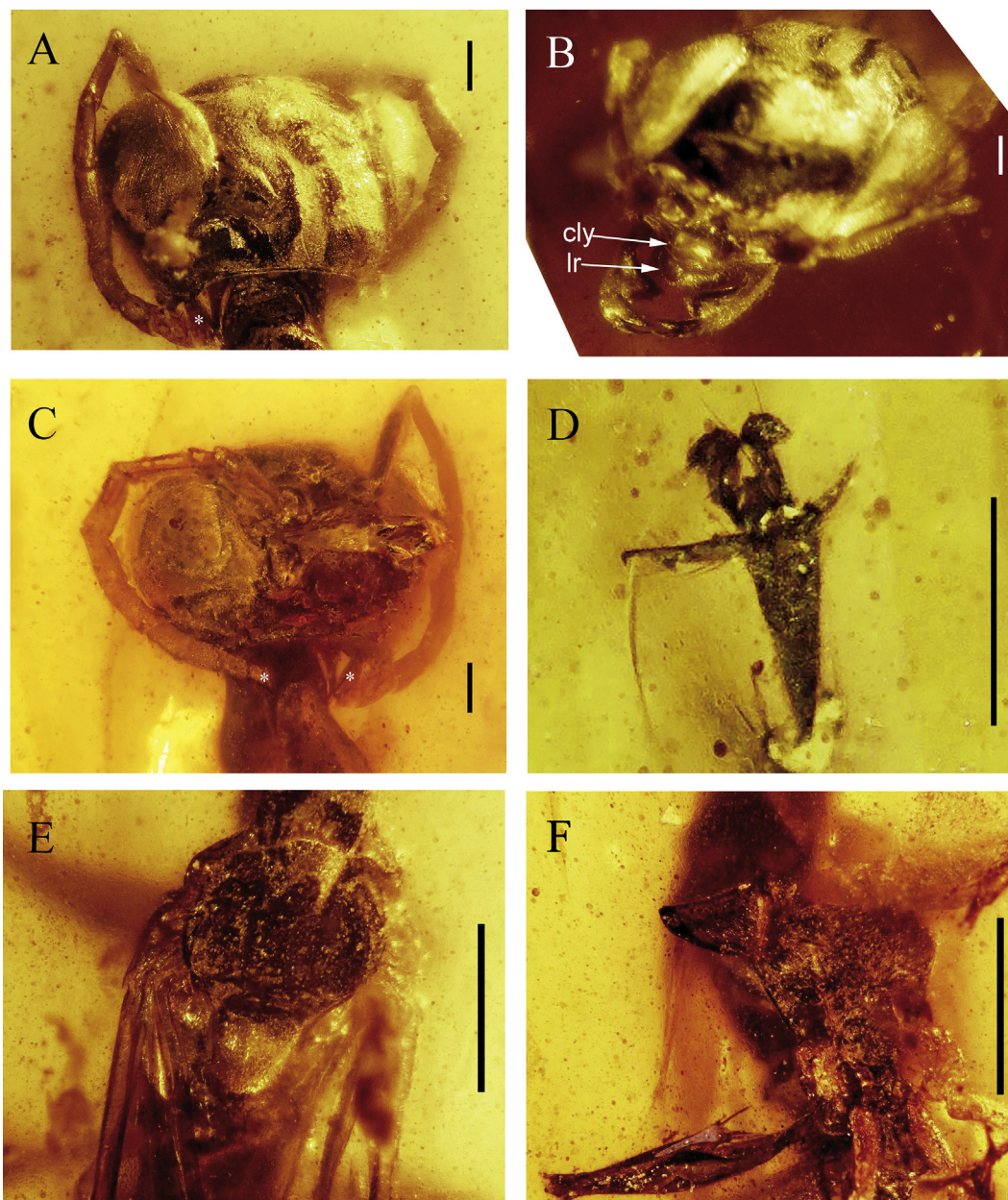


**Fig. 2.** Photographs of holotype of *DecaspheX cretacicus* gen. et sp. nov. (LYHY-013), details. (A), head and antennae dorsal view; (B) head and mandible, frontal view; (C), head and antennae ventral view; (D), hind tarsomere 5 with claws and arolium; (E), mesosoma, dorsal view; (F), mesosoma ventral view. Scale bars = 0.2 mm (A–C); 0.1 mm (D), 1 mm (E–F). Symbols: cly, clypeus, lr – labrum, \*, antennomere 10.

**Holotype.** Female, LYHY-013, mid-Cretaceous Burmese amber, stored at Institute of Geology and Paleontology, Linyi University; well-preserved except for some part of fore- and midlegs damaged and diagenetic deformation present.

**Horizon and locality.** Burmese amber, mid-Cretaceous from Hukawng Valley, Kachin State, northern Myanmar.

**Diagnosis.** As for the genus (*vide supra*).

**Description.** Female. Body small, long and slim with head large (wider than mesosoma).

Head suboval, strongly wider than long in frontal view. Eyes large, distinctly bulged out of head outline, practically reaching mandibular base, distant from hind head margin for about half interocular distance. Ocelli small, apparently forming rectangular triangle. Midfrontal line present. Clypeus narrow laterally, roundly protruding and markedly convex medially, with no medial carina.

Occipital carina low, circular. Antenna slender, 10-segmented; scape the longest and pedicel the shortest, flagellar segments gradually shortening toward apex, with apical segment distinctly diminished in length and width, with apex widely rounded. The length ratio of antennal segments 1 : 0.35 : 0.86 : 0.72 : 0.82 : 0.72 : 0.52 : 0.41 : 0.39 : 0.36. Mandibles in side view, with two apical teeth arranged vertically and massive basal tooth directed medially at mandible midlength. Labrum well extending, rounded, much asymmetrical as preserved. Maxillary(?) palp short, with 4 apical segments visible.

Pronotum long and narrow, about 2.5× as long as wide, some 0.35 as wide as head, slightly inflated anterior, narrowest in posterior 0.3, with distinct collar and with roundish apical excision, with wide, rounded lateroventral flange and with posterior (supra-spiracular) lobes almost reaching tegula. Propleura elongate, not

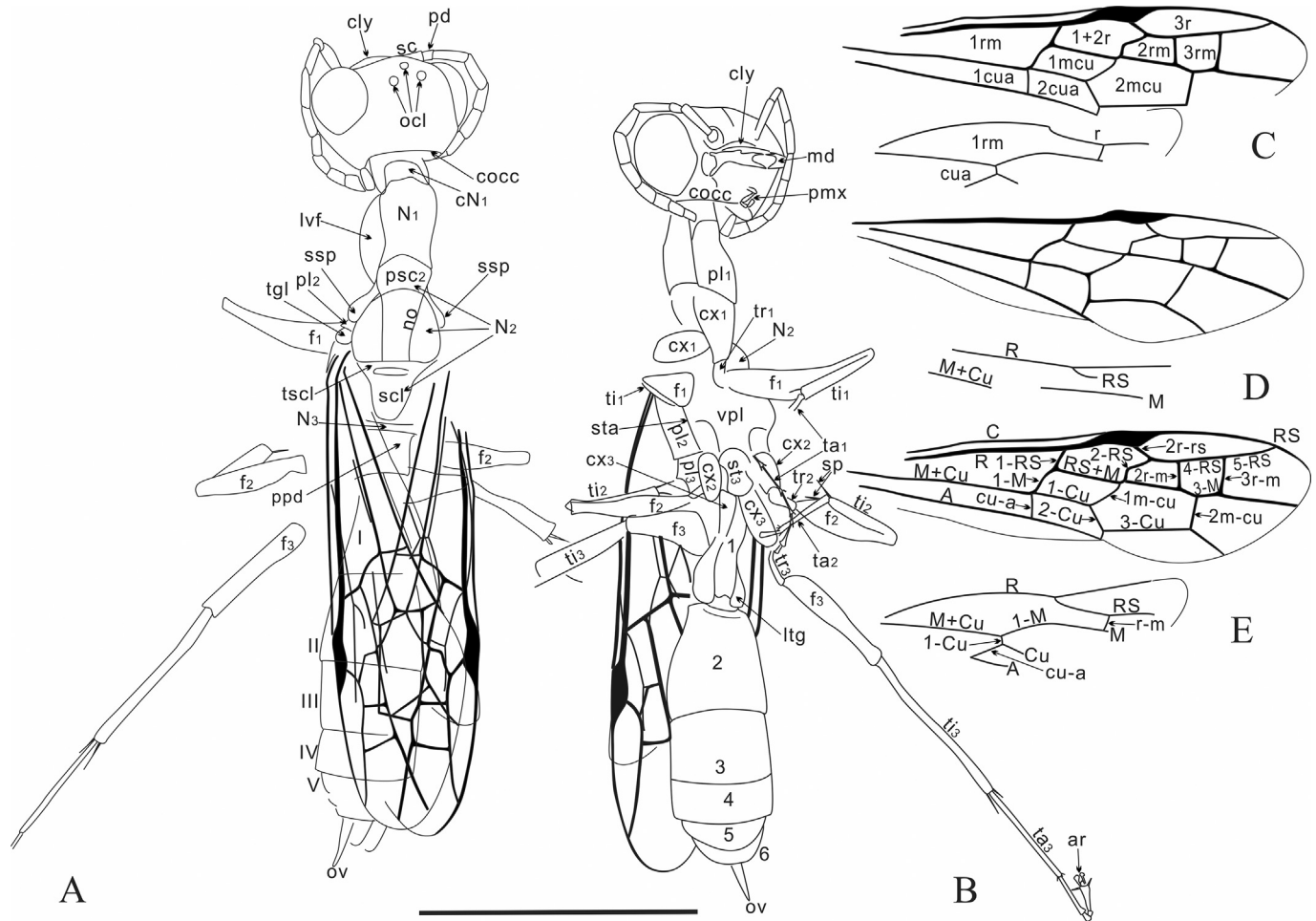


**Fig. 3.** Line drawings and details of holotype of *Decasphex cretaceus* gen. et sp. nov. (LYHY-013). (A), dorsal view; (B), ventral view; (C), left fore- and hindwing showing cell names; (D), right fore- and hindwing (mirrored); (E), interpretation of venation based on both wing pairs showing vein names. Symbols: ar = arolium, cly = clypeus, cN<sub>1</sub> = pronotal collar, cocc = occipital carina, cx<sub>1</sub>, cx<sub>2</sub>, cx<sub>3</sub> = fore, mid and hind coxa, f<sub>1</sub>, f<sub>2</sub>, f<sub>3</sub> = fore, mid and hind femur, Itg = laterotergite, lvf = lateroventral flange of pronotum, md = mandible, N<sub>1</sub> = pronotum, N<sub>2</sub> = mesonotum, N<sub>3</sub> = metanotum, no = notaulus, ocl = ocellus, ov = sting, pd = pedicel, pl<sub>1</sub>, pl<sub>2</sub>, pl<sub>3</sub> = pro-, meso- and metapleuron, pmx = maxillary palp, ppd = propodeum, psc<sub>2</sub> = mesoprescutum, sc = scape, scl = mesoscutellum, sp = spur, ssp = suprascapular lobe of pronotum, sta = sternaulus, ta<sub>1</sub>, ta<sub>2</sub>, ta<sub>3</sub> = fore, mid and hind tarsus, tgl = tegula, ti<sub>1</sub>, ti<sub>2</sub>, ti<sub>3</sub> = fore, mid and hind tibia, tr<sub>1</sub>, tr<sub>2</sub>, tr<sub>3</sub> = fore, mid and hind trochanter, tscl = transscutal line, vpl = ventropleuron, 1–6 = metasomal sternum 1–6, I–V = metasomal terga 1–5. Venation symbols following Zhang et al. (2018a). Scale bar = 1.0 mm.

extending far between head and fore margin of pronotum. Prosternum not visible externally. Mesonotum with notauli deep, percurrent, distant and subparallel behind, diverging forward; adlateral lines (parapsides) not apparent, transscutal line distinct, thin, distant from scutellar base; scutellum elongate, rounded behind, rather small. Mesopleuron with sternaulus percurrent, ventropleuron excavated before midcoxae bases (possibly to give space to midcoxae to turn far forward at running), with no lobes over hindcoxae base, with discrimin not apparent. Metanotum short. Metasternum 8-like in outline, leveled with ventropleuron, widely separating mesocoxae and about as long as these. Propodeum not well visible, apparently with dorsal surface shorter than wide, slightly narrowed towards apex, with propodeal enclosure (metapostnotum) triangular, with posterolateral angles pronounced but not toothed.

Legs practically unmodified, long and slender. Coxae elongate, mid ones separated, hind ones scarcely so; trochanters narrow, elongate; femora thickened basal; tibiae thin, not spinose, with spurs 1–2–2, hind tibia 1.42× as long as femur; tarsi thin, long, with hind basitarsus 2.5× as long as tarsomere 2, claws thin and straight before small apical hook, with massive preapical tooth slightly behind claw mid-length, particularly thin distally of preapical tooth, with two basal bristles, orbicula with two long bristles, arolium comparatively big.

Forewing with pterostigma small and fully sclerotized, about one third as wide as long and half as long as cell 1r+2r; all usual cells closed, marginal cell (3r) narrow and long (twice as long as pterostigma distally of pterostigma apex) and with acute apex touching wing margin; 1-RS clearly shorter than 1-M and distinctly angular with it; 1-RS+M straight, much longer than 1-M; 2-RS+M very short, 2-RS bent but with no rudiment of 1r-rs; 2r-rs slightly behind midlength of pterostigma; 2r-m slightly proclival, 3r-m slightly reclival, cell 2rm slightly longer than 3rm; 1m-cu not strictly parallel to 1-M, 2m-cu near midlength of cell 3rm; cu-a only slightly antefurcal (scarcely before end of M+Cu); cell 2cua about as high (about as long transversally to wing axis) as 1mcu.

Hind wing with cu-a oblique, meeting Cu soon after M+Cu bifurcation (1-Cu some 0.25× as long as cu-a), otherwise venation as preserved standard of non-chrysoid aculeates.

Metasoma with no deep constrictions between segments 1–3, with terga 1–3 of subequal length and more than twice as long as segment 4, with terga 1–2 widening rearward and tergum 3 parallel-sided. Length ratio of terga 1 through 4 = 1: 0.89: 0.68: 0.35, of sternum 1–6 = 1: 0.97: 0.75: 0.40: 0.28: 0.13. Sting straight.

Measurements: length of body 2.70 mm (excluding antenna and sting), antenna ca. 0.85 mm, head 0.35 mm, width of head 0.55 mm, length of mesosoma 1.07 mm, fore wing 1.67 mm, fore, mid and

hind femora 0.53, 0.40, 0.45 mm, fore, mid and hind tibiae 0.31, 0.31, 0.62 mm, hind tarsomeres 1, 2 and 5 0.40, 0.16 and 0.11 mm, metasoma 1.21 mm.

**Etymology.** The species name is the Latin for Cretaceous.

**Remarks.** Ten-segmented antenna is very unusual in non-chrysidoid Aculeata (= Aculeata s.str.), which makes necessary particularly strong evidence that the figure observed is real and not a result of misinterpretation which is not uncommon when a student deals with fossil material. Yet we consider the 10-segmented antenna of *K. cretacicus* is a real feature and not a misinterpretation for the following reason. Both antennae of the holotype (Fig. 2A,C) are clearly 10-segmented, and both display their apical segment (asterisked there) as much diminished in length as well as in width and, what is particularly important, with apex roundly obtuse and with no trace of an apical orifice for articulation of a next antennal segment.

#### 4. Conclusion

The new genus described herein increases the number of genera and species of the extinct family Angarosphenidae up to 15 and 50, respectively, this makes it one of the richest extinct families of Hymenoptera. It adds an unusual morphotype to the morphological diversity of Angarosphenidae as well because of its 10-segmented antenna, neck-like pronotum and heteronomous metasomal segmentation with elongate three basal segments and very short remaining ones. With its elongate body and long, slim legs, *Decaspex* gen. nov. may represent an agile and deft hunter on its prey which is unfortunately unknown taxonomically. Jointly with *Burmasphex* it represents the latest Cretaceous find of Angarosphenidae which leaves a long gap till the next finds in the Early Eocene represented by *Eosphenidae* and a few more undescribed morphotypes (Archibald et al., 2018). That gap calls for search for a rich Late Cretaceous fauna of Angarosphenidae waiting for discovery and inventory.

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