

## Short communication

## A new anaxyelid sawfly (Insecta, Hymenoptera, Siricoidea) in mid-Cretaceous Myanmar amber

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## ABSTRACT

A new sawfly, *Sclerosyntexis hirsuta* gen. et sp. nov., in the subfamily Syntexinae of the Anaxyelidae is described from the mid-Cretaceous Myanmar (Burmese) amber. The new taxa is established primarily based on the following characters, i.e. body fusiform with a large head; antenna with pedicel almost twice as long as the first flagellomere; mesonotum with longitudinal, scuto-scutellar sulci; forewing with pterostigma completely sclerotized; Sc and 1r-rs absent; hind wing with cell r open distally; 1r-m longer than 1-Rs and 1-M; m-cu lost; free ending of Cu lost, 1-Cu and cu-a straight. *Sclerosyntexis hirsuta* gen. et sp. nov. has a short and oval body shape, which is unique in Anaxyelidae, since the bodies of most xylophagous anaxyelids are long and subcylindrical. The finding is the first record of Anaxyelidae in Myanmar amber hitherto, providing important morphological characters to enhance our understanding of the Anaxyelidae.

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## 1. Introduction

Hymenoptera is one of the largest insect orders with more than 153,000 described species (Huber, 2009; Wang et al., 2016; Peters et al., 2017). To date, 156 species in 102 genera and 50 families (Ross, 2019) of Hymenoptera in Myanmar (Burmese) amber have been described, as a significant part of the world biodiversity in the Cretaceous (Zheng et al., 2018; Lin et al., 2019; Yang et al., 2019). Most of these species are represented by small parasitoid wasps (Grimaldi et al., 2002; Li et al., 2018), and only 5 species of sypstoxylid sawflies have been documented (Engel et al., 2016; Wang et al., 2019; Zheng et al., 2019).

Anaxyelidae Martynov, 1925 is a small family with only one living species, *Syntexis libocedrii*, in western North America

(Wang et al., 2018). *Syntexis libocedrii* lays eggs in the sapwood of coniferous trees, yellow juniper, giant red cedar, and probably Douglas fir, and its larvae bore in the wood (Smith, 1979; Zhang and Rasnitsyn, 2006). Anaxyelidae includes four subfamilies, and only Syntexinae Benson, 1935 comprises living groups, other three subfamilies, Dolichostigmatinae Rasnitsyn, 1968, Kempendajinae Rasnitsyn, 1980 and Anaxyelinae Martynov, 1925 have been based on fossil materials (Rasnitsyn, 1968, 1969, 1980, 1990; Zhang and Rasnitsyn, 2006). To date, 17 genera and 42 species of the family have been described (Kopylov, 2018, 2019; Ortega-Blanco et al., 2008; Rasnitsyn and Martínez-Delclòs, 2000; Wang et al., 2018; Zhang and Rasnitsyn, 2006).

In this paper, we describe a new sawfly taxon, *Sclerosyntexis hirsuta* gen. et sp. nov., within Syntexinae of Anaxyelidae, based on one well-preserved specimen from the mid-Cretaceous Myanmar amber. This sawfly is the first record of Anaxyelidae in Myanmar amber hitherto, providing important morphological characters of this family.

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## 2. Material and methods

### 2.1. Examined taxa and terminology

The amber specimen examined and studied for this paper was from the mid-Cretaceous (Cenomanian) of northern Myanmar. The holotype specimen No. CNU-HYM-MA2018032 is preserved in a piece of rectangle amber, about 17.2 mm in greatest length, 10.4 mm in greatest width, and 2.3 mm in greatest thickness. The specimen is housed in the Key Laboratory of Insect Evolution and Environmental Changes at the Capital Normal University, Beijing, China (CNUB; Dong Ren, curator).

The amber specimen was examined and photographed, either dry or wetted in glycerin, by using a Nikon SMZ25 with an attached camera system. Line drawings were prepared using Adobe Illustrator CC and Adobe Photoshop CC graphics software. The wing venation nomenclature used in the paper was modified after Rasnitsyn (1969, 1980).

### 2.2. Geological setting

The amber was from Kachin (Hukawng Valley) of Northern Myanmar. The amber mines are located at the north end of Noiye Bum that is approximately at 26°15'N, 96°34'E, 18 km south-west of Tanai (Wang et al., 2015; Li et al., 2018; fig. 1). The amber-bearing deposits of the Hukawng Valley have been studied widely, with detailed maps of the locality provided by Grimaldi et al. (2002), Cruickshank and Ko (2003). The age of the deposit has been revised at  $98.79 \pm 0.62$  Ma (earliest Cenomanian) by Shi et al. (2012). It displays clear traces of redeposition which shows that Myanmar amber was formed earlier than its enclosing rocks as it could be of mid-Cretaceous age (Cenomanian) (Ross, 2015).

## 3. Systematic palaeontology

Order Hymenoptera Linnaeus, 1758  
Suborder 'Symphyta' Gerstaecker, 1867  
Superfamily Siricoidea, Billberg, 1820  
Family Anaxyelidae Martynov, 1925  
Subfamily Syntexinae Benson, 1935

Genus: **Sclerosyntexis** Wang, Ren, Kopylov and Gao, gen. nov (Figs. 1–3).

LSID: urn:lsid:zoobank.org:act:F657497A-B8D6-4951-949D-1643AABDFB7F.

Type species: *Sclerosyntexis hirsuta* Wang, Ren, Kopylov and Gao, gen. et sp. nov., here designated.

**Etymology.** The generic name is a combination of the Greek prefix 'sclero-' (meaning sclerotized) and *Syntexis* Rohwer, the recent genus often used as a suffix for generic names in Anaxyelidae. Gender feminine.

**Diagnosis.** Body robust, fusiform. Antenna with 16 flagellomeres, scape almost 2.6 times as long as the first flagellomere, pedicel almost twice as long as the first flagellomere; mandibles with three dens; eyes large. Mesonotum with longitudinal, scuto-scutellar sulci and notauli well developed, notauli almost reaching scutellum. Forewing with pterostigma completely sclerotized; Sc absent; 1r-rs absent; 2r-rs issuing from pterostigma at its basal 1/3; 1-Rs slightly longer than 1-M; Rs + M bifurcates beyond 1m-cu (2-Rs + M present); 2+3-Rs straight, with no traces of 1r-rs; cell 1mcu pentagonal, with 1cu-a near its basal 1/3; 1cu-a strongly reclinal, joining 1A next to 1a-2a; cell 2mcu hexagonal. Hind wing with cell r open distally; 1r-m longer than 1-Rs and 1-M; 1-M short and straight; m-cu lost; free ending of Cu lost, 1-Cu and cu-a straight.

**Comparison.** The new genus is unique within Syntexinae in having robust and fusiform body; 1cu-a strongly reclined and reaching A next to 1a-2a in forewing. It differs from *Syntexis* and *Parasyntexis* in having short and straight 1-M and free ending of Cu not developed in hind wing (hind wings are not known for other Syntexinae genera). By the absence of 1r-rs and presence of 2-Rs + M, the new genus is most similar to *Eosyntexis*, but differs from it in having notauli almost reaching scutellum.

**Sclerosyntexis hirsuta** Wang, Ren, Kopylov and Gao, sp. nov.

LSID: urn:lsid:zoobank.org:act:1F25E443-52EA-4A8F-85FB-DDFE604426C0.

**Etymology.** The species name is derived from the Latin word "hirsuta", meaning hairy, referring to wings with dense hairs.

**Type material.** Holotype, No. CNU-HYM-MA2018032. Male, a well-preserved woodwasp, with an almost complete body, including antennae, forewings, hind wings, part of thorax and nine-segmented abdomen.

**Horizon and locality.** Kachin (Hukawng Valley) of northern Myanmar. The lowermost Cenomanian (near Albian boundary); mid-Cretaceous.

**Diagnosis.** As for the genus.

**Description.** Body (Figs. 1A, B, 2A) including head, thorax, abdomen and legs entirely or predominantly dark. Body about 4.11 mm in length and antenna 1.79 mm long in dorsal view; forewing about 2.67 mm in length, maximum width 1.21 mm; hind wing about 1.99 mm in length.

**Head** (Fig. 3A): moderately large, narrower than thorax. Head 1.14 mm wide and 0.84 mm long, nearly quadrate. Compound eyes massive and hemispherical; mandible bent, sickle-shaped, with subapical tooth long, sharp and slanting; antenna with 16 flagellomeres, scape 0.30 mm long, maximum 0.08 mm in width; pedicel 0.21 mm long, maximum 0.06 mm wide; first flagellomere shorter than scape, 0.05 mm wide, 0.11 mm long, as long as the remaining flagellomeres.

**Thorax** (Fig. 3A): wide, width across tegulae 1.23 mm; pronotum short, with transverse tooth-structures and prominent hind margin, and no medial line or furrow. Mesoscutum with longitudinal sulcus and notauli strongly impressed, tapering to acutely rounded base; mesoscutellum tapering to acutely sharp apex; the ratio of lengths of prescutum, longitudinal sulcus between notauli and scuto-scutellar sulcus and scutellum is 7/1/10; metascutum with cenchri present and small. Legs spindly, meso- and metafemur shorter than tibia. Metafemur (Fig. 3C) length 0.65 mm, metatibiae thick subapically, narrowed apically, length 0.89 mm. Protibiae indistinct with apical spurs, only dense setae; mesotibia and metatibia (Figs. 3B, C) with only one apical spur visible; tarsi pentamerous, all tarsomeres with hard apical setae; basitarsi long but shorter than remaining tarsomeres combined; fifth tarsomere elongate but shorter than basitarsus; medial tarsomeres about twice as long as wide except on protarsus about as long as wide; pretarsal claws long, with curved apices and minute subapical tooth, individual claw more than one-half length of fifth tarsomere.

**Abdomen:** Abdomen only slightly narrower than mesothorax; first abdominal tergite split medially. Segments I to II slightly longer than remaining abdominal segments; genitalia structures unknown.

**Forewing** (Figs. 1C, 2B): With dense hairs but no coloration pattern, except for slightly darkened costal area. C and R thick, costal area narrower than C and R width. 1-Rs long and proclival, about 1.1 times as long as 1-M, meeting 1-M at right angle. 2-Rs + M 0.2 times as long as 1-Rs + M. 2r-rs slightly proclival. M + Cu slightly S-like bent. 2-Rs + M distinct but short. 3+4-M 1.5 times as long as 5-M; 3r-m strongly reclinal. 2-Cu 1.7 times as long

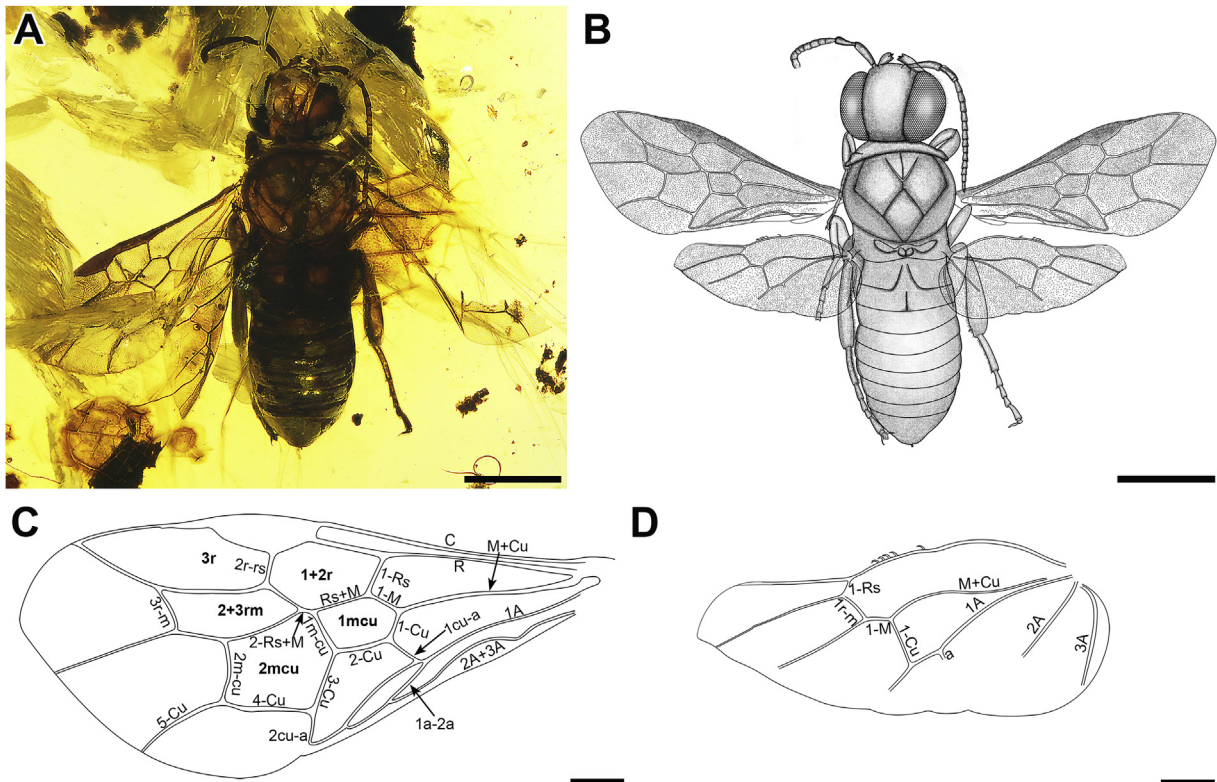


**Fig. 1.** *Sclerosyntexis hirsuta* gen. et sp. nov. Holotype No. CNU-HYM-MA2018032. A, Photograph of habitus in dorsal view. B, Line drawing in dorsal view. C, Line drawing of forewing. D, Line drawing of hind wing. Scale bars: 1 mm in A and B; 0.25 mm in C and D.

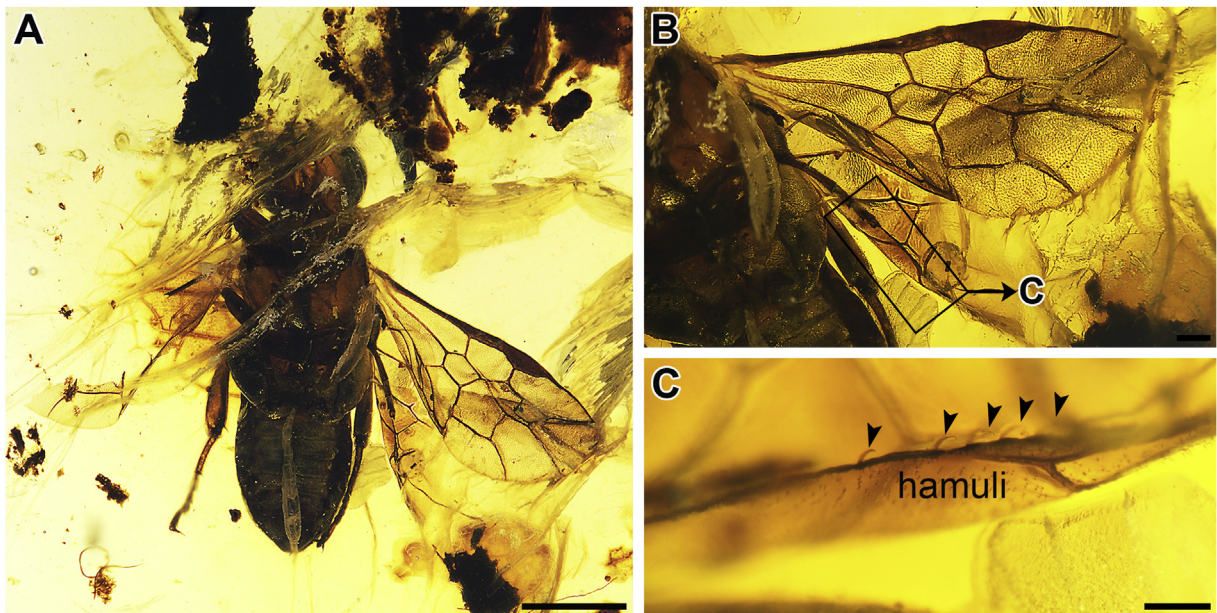


**Fig. 2.** Photographs of *S. hirsuta*. A, Habitus in ventral view. B, Forewing and hind wing in ventral view. C, Hamuli of hind wing in ventral view. Scale bars: 1 mm in A; 0.2 mm in B; 0.1 mm in C.

as 1-Cu. 1cu-a strongly reclival, nearly as long as 1-Cu. 2m-cu arched basally. 2A with shallow arch midway before 1a-2a cross-vein. Cell 2+3rm short and pentagonal, about 2.8 times as long as wide. Cell 1+2r about 1.9 times as long as wide. Cell 3r long and large, about 3.2 times as long as wide. Cell 1mcu pentagonal, about 1.6 times as long as wide. Cell 2mcu broad, nearly hexagon.

Hind wing (Fig. 1D): Hind wing with dense hairs, fore margin sinuate. Hamuli (Fig. 2C) present, five visible. Vein Sc lost; 1-Rs (about 0.06 mm in length) short, nearly half as long as 1-M (about 0.13 mm in length); 1r-m reclival, 2 times as long as 1-Rs, and 1.3 times as long as 1-M; 2-Rs and 2-M almost reaching wing margin; 2A and 3A present.

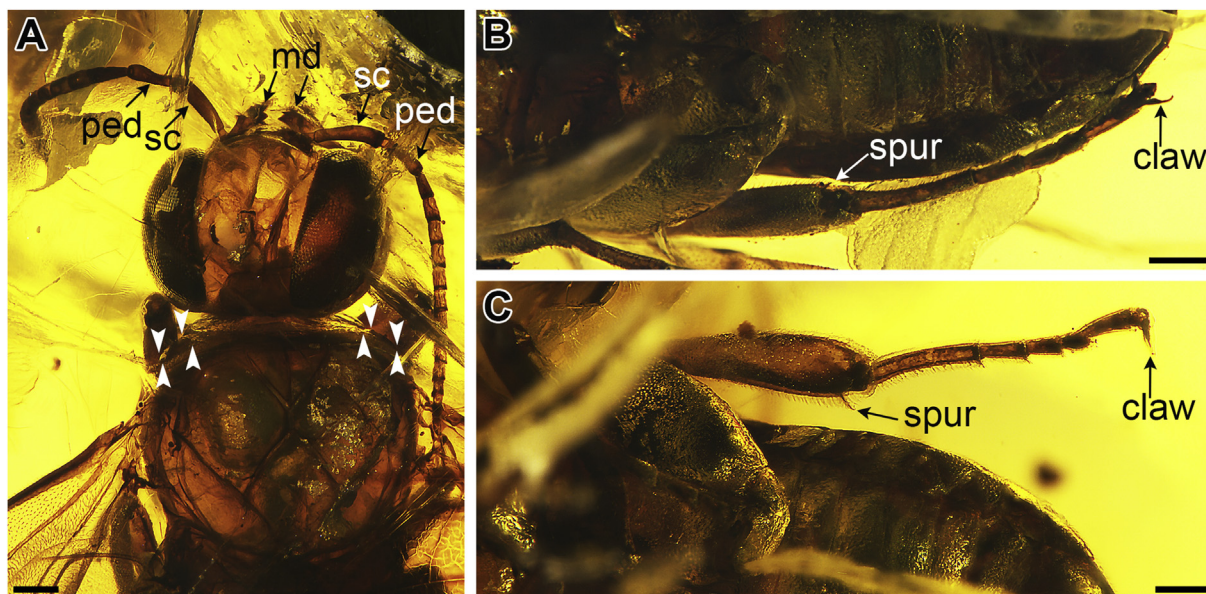


**Fig. 3.** Photographs of *S. hirsuta*. A, Head and thorax in dorsal view (White arrows indicate transverse tooth-structures on pronotum). B, Left hind leg in ventral view. C, Right hind leg in ventral view. Scale bars: 0.2 mm in A and C; 0.1 mm in B. md, mandible; sc, scape; ped, pedicel.

#### 4. Concluding remarks

The new species of sawfly, *Sclerosyntexis hirsuta* gen. et sp. nov. has transscutal suture, 1r-rs and 2r-m absent and 2-Rs + M present, indicating that *S. hirsuta* belongs to the Syntexinae (Anaxyelidae). This unusual finding is a new record and the first description of Anaxyelidae in Myanmar amber hitherto, providing important characters which can enhance our knowledge on diverse morphological characters of Anaxyelidae.

It is worth noting that *Sclerosyntexis hirsuta*, with about 4.1 mm body length, is one of the smallest known woodwasps in fossil records. Another anaxyelid with similar body length is *Eosyntexis parva* Ortega-Blanco, Rasnitsyn and Delclòs (2008) (about 4.4 mm) from Lower Cretaceous Spanish Alava amber (Martínez-Delclòs et al., 2004; Ortega-Blanco et al., 2008). Furthermore, *S. hirsuta* presents an oval body shape in contrast to long and subcylindrical body within most xylophagous woodwasps. It is supposed that body in subcylindrical shape is a feature associated with the life of wood-dwelling and/or boring (Quicke, 1997; Vilhelmsen and Turrisi, 2011). *Sclerosyntexis hirsuta* has developed transverse tooth-structures on dorsal mesonotum and the hind margin of pronotum (Fig. 3A), which can be used for anchoring the body while insect is gnawing through wood. Additional, tibial spurs can perform the same function, but not specific for wood-dwellers. Thus, it is difficult for us to reconstruct the life style of *Sclerosyntexis*. *Sclerosyntexis* possesses fusiform tibiae somewhat narrowed apically, which are usually correlated with the presence of a large subgenital organ (vibro-acoustic sensor). In some basal parasitic wasps feeding on xylophagous larvae (e.g. Orussidae, Stephanidae), tibia is well developed in fusiform shape and used for host search, which makes *Sclerosyntexis* life style rather obscure.

#### CRediT authorship contribution statement

**Yimo Wang:** Data curation, Formal analysis, Methodology, Writing - original draft. **Mei Wang:** Data curation, Formal analysis. **A.P. Rasnitsyn:** Formal analysis, Writing - review & editing. **Chungkun Shih:** Formal analysis, Writing - review & editing. **Dong**

**Ren:** Writing - review & editing. **Dmitry S. Kopylov:** Data curation, Formal analysis, Methodology, Writing - original draft. **Taiping Gao:** Project administration, Supervision, Formal analysis, Writing - original draft, Writing - review & editing.

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