



# Scydmbisetia gen. nov., the first definite Glandulariini from Upper Cretaceous Burmese amber (Coleoptera: Staphylinidae: Scydmaeninae)



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## ABSTRACT

The Glandulariini (=Cyrtoscydmini) includes about 60 genera comprising over 70% of the extant species of Scydmaeninae. This successful group is today very common and abundant in forests of all continents. However, while extinct representatives of much smaller extant tribes, as Clidicini, Eutheini and Cephenniini, were described from Cretaceous deposits, named genera and species of Glandulariini were so far known only from much younger Baltic, Sicilian and Dominican ambers. Here we report the first genus and species of definite Glandulariini from the Upper Cretaceous Burmese amber, *Scydmbisetia vetutissima* Jałoszyński and Yamamoto, gen. and sp. nov. *Scydmbisetia* is the first known glandulariine beetle with a pair of very long vertexal sensilla chaetica, previously not found in this tribe, but common among unrelated Staphylinidae. The new genus shows similarities to the extant genera *Anthicimimus*, *Sciacharis*, *Spinosciacharis* and *Horaeomorphus*, but *S. vetutissima* has protibial modifications typical of males of some extant species of *Euconnus*. We discuss the apparent disproportion in the oldest fossil record of various tribes of scydmaenines as a result of identification problems, and not the lack of known fossils.

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## 1. Introduction

The staphylinid subfamily Scydmaeninae or ant-like stone beetles is currently divided into four supertribes: Cephenniitae Reitter, 1882, Hapsomelitae Poinar & Brown, 2004, Mastigitae Fleming, 1821 and Scydmaenitae Leach, 1815 (Grebennikov and Newton, 2009; Jałoszyński, 2014a). Hapsomelitae is an entirely extinct and poorly defined group of enigmatic Cretaceous scydmaenines of unclear relationships, whereas the remaining supertribes comprise about 5000 extant species classified into over 100 genera, but only about 20 extinct species (Jałoszyński, 2016). All known fossils of Scydmaeninae are amber inclusions. The few described Miocene, Eocene and Cretaceous fossils of Cephenniitae

and Mastigitae belong to the best morphologically characterized extinct scydmaenines, whose phylogenetic relationships were studied and their systematic placement was well-supported (O'Keefe et al., 1997; O'Keefe, 2002; Jałoszyński, 2012a; Jałoszyński and Peris, 2016). Surprisingly, not a single nominal genus of the largest supertribe, the Scydmaenitae, has been described from any Cretaceous deposits.

The extant Scydmaenitae is the largest group of scydmaenines, comprising nearly 90% of all ant-like stone beetle species and over half of all known genera. The largest tribe of Scydmaenitae, the cosmopolitan Glandulariini Schaufuss, 1889 (=Cyrtoscydmini Schaufuss, 1889; synonymized by Newton (2015)), with over 3600 species accounts for over 70% of the known extant species richness of scydmaenines. Glandulariines are very diverse in terms of body forms and morphological structures. This group includes the second largest genus of any organisms on Earth, the hyperdiverse *Euconnus* Thomson, 1859, currently comprising nearly 2500 nominal species (Newton and Franz, 1998). However, the true species

Abbreviations: AMNH, American Museum of Natural History, New York, USA.

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richness of Glandulariini is many times higher. Specimens representing undescribed species accumulated in major museum collections highly outnumber the described ones (Jałoszyński, unpublished obs.). Judging from known fossils of other tribes of Scydmaeninae and results of phylogenetic studies (e.g., Jałoszyński, 2014a), there are no reasons to believe that such a great radiation of Glandulariini has taken place only recently. It seems more likely that this tribe is not significantly younger than Cephenniitae or Mastigitae (known from the Cretaceous), and therefore the very poor documented fossil record is surprising.

Only four genera of Glandulariini were identified so far in Baltic, Dominican and Sicilian ambers (Schaufuss, 1890; Franz, 1976, 1983; Spahr, 1981), so of a relatively young, Eocene–Miocene age. They include extant genera *Euconnus* Thomson, 1859 (5 extinct species), *Homoconnus* Sharp, 1887 (1 sp.), *Neuraphes* Thomson, 1859 (1 sp.) and *Stenichnus* Thomson, 1859 (4 spp.) (summarized by Newton and Franz (1998)). However, the placement of species described in *Neuraphes*, and possibly also in *Stenichnus*, remains to be confirmed. Some Glandulariini may also hide among nine more genera of Scydmaeninae, all extinct, described from Eocene and Miocene ambers, whose diagnoses are too vague and therefore their placement is unclear. They all were treated as *incertae sedis* within Scydmaeninae by Newton and Franz (1998). No species of Glandulariini have been described from any older deposits.

The lack of any nominal species of Glandulariini from the Cretaceous might suggest that this group has either undergone a substantial diversification and radiation later, or its members were rare or inhabited environments of a low fossilization potential. This may be a false picture, as inclusions of Glandulariini are not in fact uncommon in Cretaceous ambers (Jałoszyński, personal obs.). The reason why they remain undescribed may be related to the problems of properly diagnosing extinct genera and species, i.e., to provide an unambiguous set of character states to distinguish them from extant scydmaenines. It is also not an easy task to demonstrate that fossil specimens truly belong in Glandulariini. Although the general habitus for an experienced specialist in many cases undoubtedly indicates a member of this tribe, the apomorphy of Glandulariini, i.e., the subconical and very small maxillary palpomere 4 (e.g., Jałoszyński, 2012b, 2015a), is rarely visible in minute amber inclusions (Jałoszyński, personal obs.).

In the present study we report for the first time an occurrence of a definite Glandulariini genus in the Upper Cretaceous amber of Burma. This is also the first unambiguously defined extinct genus that differs from all extant Glandulariini in the presence of intriguing cephalic characters.

## 2. Geographic and geological context

The specimen used in this study comes from the Hukawng Valley situated in the Kachin State, northern Burma (Fig. 1). Burmese amber has been recorded from several sites, but the only commercial source is the Hukawng Valley (Zherikhin and Ross, 2000). The valley is a flat alluvial plain surrounded by hills and the amber mine is located on the northern part of a hill known as Noije Bum (26°15'N; 96°34'E), about 20 km southwest of the town of Tanai (Cruickshank and Ko, 2003). Folded Cretaceous and Cenozoic deposits are recovered in the valley, and a variety of clastic sedimentary rocks (fine clastic to granule conglomerate) with thin limestone beds are recognized at the Noije Bum Amber Mine (Cruickshank and Ko, 2003). Amber is associated with fine-grained facies; zircons obtained from the amber matrix indicate the earliest Cenomanian age (98.79 ± 0.62 Ma) based on U–Pb dating by Shi et al. (2012). These sediments have been deposited in a nearshore marine environment (Cruickshank and Ko, 2003).

## 3. Material and methods

### 3.1. Specimen handling and imaging

The fossil specimen here described is deposited in AMNH and was assigned a collection number AMNH Bu-SY3. The inclusion is in an irregular, polished prism of amber about 9 × 5 × 3 mm; it was observed (as dry specimen and submerged in the cedar oil) under a Nikon SMS1500 (Nikon, Tokyo, Japan) and Leica M205C (Leica Microsystems, Wetzlar, Germany) stereomicroscopes. Photographs were taken on white and blue backgrounds using a KYF75U digital camera (JVC, Yokohama, Japan) mounted to the Leica microscope. Image stacks were processed using COMBINE ZP (Hadley, 2010) and edited with Corel PhotoPaint 9.397. Morphological structures were figured by freehand drawing, with exact proportions and general shapes sketched from photographs. Measurement convention and the terminology of morphological structures follow those of Jałoszyński (2015b). This study is registered in ZooBank under urn:lsid:zoobank.org:pub:05CA6367-BA35-4788-A27F-D721ED288848.

## 4. Systematic palaeontology

Suborder: Polyphaga Emery, 1886  
 Superfamily: Staphylinoidea Latreille, 1802  
 Family: Staphylinidae Latreille, 1802  
 Subfamily: Scydmaeninae Leach, 1815  
 Tribe: Glandulariini Schaufuss, 1889

Genus *Scydmobisetia* Jałoszyński and Yamamoto gen. nov.  
 urn:lsid:zoobank.org:act:06DF46D0-647C-4185-9BEF-331AD2E5C885

Figs. 2–4

*Derivation of name.* The name is a combination of the prefix *scydm* – referring to the Scydmaeninae and – *bisetia*, derived from two setae (a unique apomorphy of the new genus). Gender feminine.

*Type species.* *Scydmobisetia vetustissima* Jałoszyński and Yamamoto.

*Diagnosis.* *Scydmobisetia* is a glandulariine genus showing a unique apomorphy, one pair of very long vertexal sensilla (lacking in all extant Glandulariini). Additionally, it shows the following combination of characters, that separately or in different configuration, occur also in other Glandulariini genera: head and prothorax lacking thick bristles; head subhexagonal with occipital constriction as wide as about half of head width; tempora longer than eyes; antennal insertions broadly separated; antennae gradually thickened distally and loosely assembled; pronotum strongly elongate and broadest in front of middle; basisternal part of prosternum about as long as coxal part; pro- and metacoxae contiguous, mesocoxae either contiguous or indistinctly separated; suture between abdominal sternites 7 and 8 distinct; protibiae with ventral sub-apical tooth-like projection.

*Description.* Body (Figs. 2A, B, 3A–C) strongly elongate and flattened, strongly constricted between head and pronotum and between pronotum and elytra. Head capsule (Figs. 2C–E, 4A, B) divided into large and exposed anterior part and smaller posterior ‘neck’ region largely retracted into prothorax and demarcated by occipital constriction (Fig. 4A; *occ*) as wide as about half of head width; anterior part of head in dorsal view subhexagonal; vertex (Fig. 4A; *vt*) strongly transverse, with pair of long posterolateral sensilla chaetica (Figs. 2C, D, 4A, B; *se*); tempora (Fig. 4A; *tm*) much longer than eye in dorsal view; frons (Fig. 4A; *fr*) subtrapezoidal; clypeus (Fig. 4A; *cl*) not demarcated from frons; antennal sockets broadly separated and located in large anterolateral antennal

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