A new genus of sap beetles in Cretaceous amber from northern Myanmar (Coleoptera: Nitiduloidea: Nitidulidae)

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Abstract

Nitidulidae is a polyphagan family with high biodiversity, wide distribution, and rich feeding habits. The richness of the tribes of the subfamily Nitidulinae, their diversity of identification characteristics, and subtle differences make it more difficult to conduct a taxonomic study of Nitidulinae in Cretaceous Burmese amber. Here we report a new genus and species of sap beetles in Burmese amber, Spinanitidula nigrumflavo ZHAO & CAI gen. and sp. nov., that is clearly distinguished from all nitidulid subfamilies except Nitidulinae. We tentatively place Spinanitidula nigrumflavo gen. and sp. nov. in Nitidulinae and compare Spinanitidula in detail with representatives of all tribes in the subfamily. Furthermore, we found that, apart from a row of spines on the inner and outer edges of protibiae, there are four rows of spines on the dorsolateral edge of mesotibiae in the new species, which is different from extant nitidulids. Our discovery enriches the fossil record of Nitidulidae in mid-Cretaceous Burmese amber.

Key words: Fossil, beetle, Nitidulinae, systematics, Kachin amber
1. Introduction

Nitidulidae is one of the most diverse beetle families, with approximately 350 genera and 4500 extant species (JELÍNEK et al. 2010). The extant Nitidulidae can be divided into 11 subfamilies: Calonecrinae, Maynipeplinae, Epuraeinae, Carpophilinae, Amphicrossinae, Meligethinae, Nitidulinae, Cillaeinae, Crytarchinae, Cybocephalinae, and Prometopiinae (JELÍNEK et al., 2010; CLINE et al. 2014; CAI et al. 2022). Nitidulidae is widely distributed mainly in the holarctic and tropics, except for Maynipeplinae, which is in Africa, and Calonecrinae, which is in Southeast Asia (JELÍNEK et al. 2010). Nitidulids have various feeding habits, ranging from mycophagy to tree sap feeding (LEE et al. 2020). Among them, specialized anthophagy occur among larvae and/or adults in Meligethinae, Epuraeinae, Cillaeinae, Carpophilinae and some Nitidulinae (JELÍNEK et al. 2010; KIREJTSHUK 1997; LEE et al. 2020). Extant nitidulid beetles usually have the following features, such as an exposed pygidium, distinct subantennal grooves, an 11-segmented antenna with the last three antennomeres forming a compact club, reduced maxilla in the adult and 5-segmented tarsi (JELÍNEK et al. 2010; LAWRENCE & ŚLIPIŃSKI 2013; CLINE et al. 2014).

Recent phylogenomic studies show that Nitidulidae can be classified into the Nitiduloidae with Kateretidae and Smicripidae (CAI et al. 2022). Among the eleven subfamilies in Nitidulidae, six subfamilies (Cryptarchinae, Prometopiinae, Amphicrossinae, Carpophilinae, Cillaeinae, and Meligethinae) are monophyletic, while Calonecrinae and Epuraeinae are paraphyletic (LEE et al. 2020). Nitidulinae is polyphyly, divided into four nitidulinae clades with seven monophyletic thinner branches in phylogenomic result (LEE et al. 2020). Detail phylogenetic placements of Maynipeplinae and Cybocephalinae remain ambiguous, but diagnostic features of both two subfamilies are clear and easy to use (KIREJTSHUK 1998a; CLINE et al. 2014).

Currently, further research on fossils is necessary to fully understand Nitidulidae. A total of 35 genera and 56 species have been known in the fossil record (KIREJTSHUK & NEL 2018;
The majority of these fossil species are known from the Eocene Baltic amber, with only seven species being from the Cretaceous (KIREJTSHUK & NEL 2018; KIREJTSHUK et al. 2023). So far, Mesozoic nitidulids encompass four species preserved as compressed fossils, which are classified into two genera, namely Crepuraea archaica KIREJTSHUK, 1990; Crepuraea explanata KIREJTSHUK, 1990; Crepuraea zherichini KIREJTSHUK, 1990; Cyllolithus mirandus KIREJTSHUK, 1990; (KIREJTSHUK & PONOMARENKO 1990), and three nitidulids described from Burmese amber, Sorodites angustipes KIREJTSHUK & CHETVERIKOV, 2018, Protonitidula nelii ZHAO et al., 2022, and Phenolia (Palaeoronia) haoranae KIREJTSHUK & JENKINS SHAW, 2023 (KIREJTSHUK & CHETVERIKOV 2018; ZHAO et al. 2022; KIREJTSHUK et al. 2023). Here, we describe a new nitidulid beetle with a special arrangement of spines that is different from extant nitidulids.

2. Material and Methods

The specimen described here is housed in the Nanjing Institute of Geology and Palaeontology (NIGP), Chinese Academy of Sciences, Nanjing, China. The amber piece was ground with sandpapers of different grit sizes, and polished with diatomite mud (SIDORCHUK & VORONTSOV 2018). Photographs were taken using two devices: a Zeiss Stereo Discovery V16 microscope system with an incident light and a transmitted light, and a Zeiss LSM 710 confocal laser scanning microscope (CLSM) with digital cameras attached (CAI & HUANG 2014; FU et al. 2021). The images were stacked using Helicon Focus 7.0.2 to achieve an extended depth of field. Figure plates were compiled and arranged in Adobe Photoshop 2021.

The Burmese (Kachin) amber specimens were derived from an amber mine near the Noije Bum Hill summit site, 20 km southwest of Tanai, in the Hukawng Valley, Kachin Province, northern Myanmar (CRUICKSHANK & KO 2003; YIN et al. 2018). According to palaeontological and
radioactive data, the age of the Myanmar amber from Kachin has been constrained to the mid-Cretaceous, but earlier than the Cenomanian (around 98.79 ± 0.62 Ma) (SHI et al. 2012; MAO et al. 2018).

This published work and the nomenclatural acts it contains have been registered in ZooBank, the proposed online registration system for the International Code of Zoological Nomenclature (ICZN).

3. Systematic Palaeontology

Order: Coleoptera LINNAEUS, 1758
Superfamily: Nitiduloidea LATREILLE, 1802
Family: Nitidulidae LATREILLE, 1802
Subfamily: Nitidulinae LATREILLE, 1802

Genus Spinanitidula Zhao & CAI gen. nov.

Figures 1–4 (font size 9 in white color)

Type species. Spinanitidula nigrumflavo sp. nov.

Etymology. The generic name ‘Spinanitidula’ is a combination of Latinized word ‘Spina-’, indicating the tibial spines, and suffix ‘-nitidula’, a common suffix for generic name in Nitidulidae, the family which the beetles belong to.

Description. Body ovate and dorsally convex (Fig 1A). Head strongly declined (Fig 1A). Compound eyes protuberant, enlarged and temple poorly developed (Fig 2A). Clypeus transverse (Fig 2A, 2B). Labrum transverse, bilobed (Fig 2B). Mandibles simple (Fig 2A, 2B). Antenna 11-segmented, with 3-segmented compact antennal club; scape enlarged, antennomeres 2–3 subequal in length and width, antennomere 4 slightly shorter than the preceding two antennomeres, antennomere 5 slightly longer than antennomere 4; antennomeres 9–11 form a compact, non-parallel-sided antennal club (Fig 3A, 3B). Mentum and submentum transverse and abroad (Fig 3C).

Pronotum transverse, with unparallel and narrowly explanate lateral margin (Fig 1A). Anterior angles prominent and round; posterior angles acute and projecting (Fig 1A). Disc of pronotum sparsely (Fig 1A). Scutellum small and triangular (Fig 1A).

Elytra complete and large, with part of pygidium exposed dorsally; elytral sides narrowly explanted; disc diffusely punctated and sparsely setose (Fig 1A). Prosternum transverse and broad (Fig 1B). Procoxal cavity open (Fig 2C). Prosternal process broad, projecting backward across anterior margin of mesosternum (Fig 1B), with triangle terminal margin, sparsely bearing short spines along the border (Fig 2D). Posterior margin of metasternum concave medially (Fig 1B).

Abdomen with five visible segments, with ventrites narrow down gradually, and ventrite 5 with short spines on terminal and with one densely setose lobe (Fig 2E, 2F).

Femora canaliculate for reception of tibiae (Fig 1B). Tibiae widen gradually, with inverted triangle terminal, with tibial spur (Fig 4); protibiae armed with one row of spines on the outer edge and inner edge (Fig 4A); meso- and metatibiae wrapped by four rows of spines on the outer lateral edge (Fig 4B, 4C, 4D). Tarsi 5-5-5, tarsomeres 1-3 densely setose; tarsomere 4 round and smallest; tarsomere 5 elongate (Fig 3D, 4E). Tarsal claws simple (Fig 4F).

Included species. Spinanitidula nigrumflavo gen. et sp. nov., here designated.

Spinanitidula nigrumflavo ZHAO & CAI sp. nov.
Etymology. The specific epithet is a combination of the Latin words ‘nigrum-’, and ‘-flavo’, used to indicate black and yellow dorsoventral surface of this species.

Diagnosis. Antenna sparsely setose; antennomeres 2–4 subequal in length and width. Pronotal posterior angles acute and projecting. Elytra simply irregularly punctated and setose. Distance between metacoxae ca. 1.2 times as great as that between procoxae or that between mesocoxae. Tibiae widen gradually, and armed by a circle of short spur in the apical angle. Protibiae armed with one row of spines on the outer edge and inner edge; meso- and metatibiae wrapped by four rows of spines on the outer lateral edge.

Holotype. NIGP- 202798

Type locality and horizon. Amber obtained in the Hukawng Valley, Myitkyina District, Kachin State, Myanmar; Cenomanian to late Albian (mid-Cretaceous) (SHI et al., 2012; MAO et al., 2018).

Description. Body dorsal surface with sparsely short setose (Fig. 1). Color dark black dorsally and yellow ventrally (Fig. 1). Body length 6.3 mm (from terminal of pigydium to apex of head dorsally), body width 4.0 mm across the elytra at the broadest point (Fig. 1A).

Head width 1.8 mm across eyes, and length 1.3 mm (measured from apex of mandibles to pronotal anterior edge) (Fig. 2A). Occipital sulcus distinct, with head slightly constricted behind eyes to form a neck (Fig. 1A, 2A). Compound eyes protuberant, enlarged and more surpassing temples, temple poorly developed; nearly oval, situated at the sides of head; interfacetal setae absent (Fig. 1A, 2A). Antennal insertions broadly sparated (Fig. 2A). Anterior margin of clypeus slightly concave (Fig. 2A 2B). Labrum densely setose (Fig. 2A 2B). Antenna sparsely setose, widely separated (Fig. 3A); scape twice as long as pedicel, 1.4 times as wide as pedicel; antennomeres 6–8 shorten and widen gradually; antennomeres 9 2.5 times as wide as the preceding antennomere, and 1.6 times as long as antennomere 8; last two antennomeres covered by protibiae (Fig. 3B). Mentum transverse and broad (Fig. 3C).
Pronotum 1.8 mm long, 3.9 mm wide (measured from posterior margin), subequal to widest combined elytron width (Fig. 1A). Anterior margin shorter than posterior; posterior margin smooth, arc-shaped, concealing base of the elytra and scutellum (Fig. 1A). Disc of pronotum sparsely covered by short fur (Fig. 1A).

Elytra length 4.0 mm, two thirds of body length, equal to body width, with part of pygidium exposed dorsally; simply diffusely punctated and sparsely short setose (Fig. 1A). Prosternum densely punctate and setose (Fig. 1B). Prosternal process width 0.3 mm, slightly wider than meso- and metacoxal distance (Fig 1B, 2D). Metasternum distinct, centre of anterior margin convex (Fig. 1B). Distance between metacoxae probably 1.2 times as great as that between procoxae or that between mesocoxae (Fig. 1B).

Abdomen with ventrite 1 longest and about 2.5 times as long as the following ventrite; ventrites 2-4 subequal in length; ventrite 5 shorter than ventrite 1, around 1.5 times as long as ventrite 2 (Fig. 2E, 2F).

4. Discussion

*Spinanitidula nigrumflavo* can be classified into the Nitidulidae based on the following shared morphological characteristics: antennae 11-segmented with 3-segmented strong and compact club, wide prosternal process, tarsi 5-5-5, pygidium exposed dorsally, tarsomeres 1–3 subequal in length, at least one carina with spines on outer edge of all tibiae (JELÍNEK & CLINE 2010; JELÍNEK et al. 2010).

*Spinanitidula* belongs to Nitidulidae, but is different from the majority of extant subfamilies in nitidulids. *Spinanitidula nigrumflavo* is different with Cybocephalinae and Cryptarchinae in having 5-segmented tarsi and free labrum, which is not concealed under anterior margin of clypeus (JELÍNEK et al. 2010; LAWRENCE & ŚLIPIŃSKI 2013). *Spinanitidula* differs from Cillaeinae and Carpophilinae by complete elytra, with pygidium exposed only (JELÍNEK et al. 2010; LAWRENCE
Besides, the characteristic 11-segmented antenna with 3-segmented compact club is important to distinguished Spinanitidula from Calonecrinae and Maynipeplinae (JELÍNEK et al. 2010; LAWRENCE & ŚLIPIŃSKI 2013). Spinanitidula is different with Prometopinae in following characters: abdominal sternite 1 without diverging metacoxal lines, which normally exist in this subfamily; antennomeres 2–3 is subequal in length instead of that antennomere 3 is twice as long as pedicel (CLINE et al. 2014). Additionally, there are some differences on tibia to distinguished Spinanitidula from Meligethinae, one of the anthophagous subfamilies: meso- and metatibiae are not strongly flattened, and tibiae with four rows of spine dorsally, but tibiae are armed by one outer carina bearing setae in Meligethinae (JELÍNEK et al. 2010; LAWRENCE & ŚLIPIŃSKI 2013). Moreover, S. nigrumflavo has some differences from Epuraeinae as follows, metasternum without distinct medial sutures and tarsomeres 1–3 not lobed but dilated apically (KIREJTSHUK 1998b).

Although Spinanitidula shows a more similar morphology with some extant species in Amphicrossinae, compared to above nine subfamilies, there are still some subtle features different between new species and Amphicrossinae as follow (DASGUPTA & PAL 2019): In S. nigrumflavo the lateral margins of pronotum and elytra without densely row of setae, and labrum without a median heart-shaped depression, meso- and metacoxal cavities wide as same as width of prosternal process, tarsomeres 1–3 dilated apically in all tibiae; on the contrary, Amphicrossinae show lateral margins of pronotum and elytra with densely row of setae and labrum with a median heart-shaped depression, prosternal process is narrow, tarsomeres 1–3 dilated apically in pro- and mesotibiae but narrow and elongate in metatibia.

Nitidulinae is the only subfamily remining, a large and complex subfamily, which is a polyphyly, with four clades including seven branches (KIREJTSHUK 2008; LAWRENCE 2019; LEE et al. 2020), which means that the morphological comparison about Nitidulinae will be more difficult compared with the other ten subfamilies, so it is necessary to compared S. nigrumflavo with
the seven tribes included in Nitidulinae, *i.e.*, Nitidulini ERICHSON, 1843; Cychramini
LACORDIRE, 1854; Mystropini MURRAY, 1864; Cyllodini EVERTS, 1898; Cychramptodini
KIREJTSHUK & LAWRENCE, 1992; Lawrencerosini KIREJTSHUK, 1990; Amborotubini
LESCHEN & CARLTON, 2004, of which number is consistent with that of monophyletic branches
(LESCHEN & CARLTON 2004; KIREJTSHUK 2008). There are subtle differences between
Cyllodini and Cychramini, as well as between Lawrencerosini and Cychramptodini (LAWRENCE
2019; KIREJTSHUK & LAWRENCE 1992). Cylldini is similar to Cychramini, except that strongly
convex body dorsally with declined head, and glabrous dorsal surface (LAWRENCE 2019).
Cychramptodini differs from Lawrencerosini in strongly convex body and strongly declined head,
round abdominal apex, short antennae and leg (KIREJTSHUK & LAWRENCE 1992). As for
Mystropini, the only character that can be used to distinguished them from other nitidulid tribes is
the absence of antennal grooves on the ventral surface (JELÍNEK et al. 2010). Nitidulini is the
largest and most complex tribe, identified by the punctate rows on the elytral disc (JELÍNEK et al.
2010; LAWRENCE 2019). Different from the other six tribes, there is no tribes similar to
Amborotubini, and the identification characteristics are clear (LESCHEN & CARLTON 2004).

*Spinanitidula* has some differences from seven tribes in Nitidulinae. The new species is different
with Amborotubini in the following characters: clypeus slightly concaved, not bilobed; tibiae not
flattened; tarsomeres 1–3 densely setose (LESCHEN & CARLTON 2004). It differs also from
Lawrencerosini in the head strongly turned downward, scape elongate longitudinally, posterior edge
of pronotum concealing base of the elytra and scutellum, abdominal apex rounded, and femora thicker
than tibiae (KIREJTSHUK & LAWRENCE 1992). *Spinanitidula* differs from Cychramptodini by its
pronotal side narrowly explanate, legs not strongly compressed dorsoventrally and femora longer and
wider than tibiae (KIREJTSHUK & LAWRENCE 1992). Cychramini resemble the species in
Cyllodini, although dorsal surface is pubescent and pronotal base margined in Cychramini, while
dorsal surfaces are glabrous, and pronotal sides are unbordered, covering scutellar shield and elytra, in
Cyllodini (LAWRENCE 2019; LAWRENCE & KIREJTSHUK 2019). However, *Spinanitidula* has the dorsal surface with sparsely short setae, sides of pronotum and elytra horizontally explanate, and metaventrite without distinct intercoxal lines, but dorsal surface is glabrous, sides of pronotum and elytra inclined ventrally, and metaventrite without distinct intercoxal lines in Cyllodini (LAWRENCE 2019; LAWRENCE & KIREJTSHUK 2019). *Spinanitidula* shows the prosternum with intercoxal prosternal process projecting beyond anterior margin of mesosternum, but the prosternum is shortened with a rather short intercoxal process in Cychramini (LAWRENCE 2019; LAWRENCE & KIREJTSHUK 2019).

Nitidulini is a complex and large tribe in subfamily Nitidulinae, consists of nine generic complexes, which made it difficult to form a clear and simple diagnosis, so that the focus of classification about Nitidulini is on elytral punctuation and vestiture (JELÍNEK et al. 2010; LAWRENCE 2019). *Spinanitidula* differs, nevertheless, from Nitidulini in head turn downward ventrally, and the elytra disc sparsely setose irregularly, without 10 punctate rows, while strongly declined head is rare, and elytral vestiture is usually regular and with at least 10 punctate rows in Nitidulini (LAWRENCE 2019; JELÍNEK et al. 2010). As for Mystropini, the only character can be used to distinguish them from other nitidulid tribes is the absence of antennal grooves on the ventral surface (KIREJTSHUK & JELINEK 2000; JELÍNEK et al. 2010). Regrettably, it is difficult to observe the ventral surface of *S. nigrumflavo* completely and clearly because of strongly inclined head and masking of other objects, therefore, it is necessary to compare *Spinanitidula* with the genera within the tribe Mystropini.

according to the following characters: small scutellum, acute and prominent pronotal posterior angles, and tarsus 1–3 of the same length (KIREJTSHUK & COUTURIER 2010). The new genus is equally different from Anthocorina in: elytra as long as combined width, and tibiae shorter than femora (KIREJTSHUK & COUTURIER 2010). Spinanitidula can be also directly distinguished from the genera Mystrops, Platychorodes and Paleocorcia by the lack of conspicuous long pubescence on dorsal and lateral sides of pronotum and elytra, sparse setae on antennae, and meso- and metacoxal distance slightly shorter than prosternal process (KIREJTSHUK & JELINEK 2000; KIREJTSHUK & COUTURIER 2010). Besides, the new genus is different from Palmostrops and Cychocephalus in transverse labrum with shallowly emarginate anterior margin, and transverse mentum (KIREJTSHUK & JELINEK 2000). Finally, Spinanitidula and Nitidula are not only different in decoration, but also in prosternal process, since prosternal process is not curved along coxae in the fossil (KIREJTSHUK & JELINEK 2000).

Despite the relatively high number of fossil nitidulids known, only the Cretaceous amber from Myanmar is preserving Mesozoic nitidulids in amber (PERIS 2016). These fossils are Sorodites angustipes, Protonitidula neli, and Phenolia (Palaeoronia) haoranae (KIREJTSHUK & CHETVERIKOV 2018; ZHAO et al. 2022; KIREJTSHUK et al. 2023). Sorodites angustipes is the first nitidulid fossil reported from Burmese amber; Spinanitidula gen. nov. is distinguished from Sorodites KIREJTSHUK, 2018 in the strongly declined head, oval body, narrow explanate pronotal and elytral sides, and the straight and broad prosternal process (KIREJTSHUK & CHETVERIKOV 2018). It is worth noting that Protonitidula neli was previously considered as a member of Apophisandridae KIREJTSHUK & JENKINS SHAW, 2023, due to the loosely antennal club, ovipositor which is similar to Kateretidae, tibial carinae with row of spines and simple tarsomeres 1–4 (KIREJTSHUK et al. 2023). However, the carina pattern on tibiae of Protonitidula neli can still be found in extant Nitidulidae beetles, such as outer lateral margin denticulate on protibiae in Meligethinae and Nitidulinae, and a row of long spines on outer edge of meso- and metatibiae in
Meligethinae, and extant tarsomeres of extant nitidulids varies from simple to bilobed, which indicate that simple tarsomeres of Protonitidula neli is still a pattern of tarsi of Nitidulidae (JELÍNEK et al. 2010; ZHAO et al. 2022). Besides, the loosely antennal club and the ovipositor imply that Protonitidula neli is a Nitidulidae species similar to Kateretidae (ZHAO et al. 2022).

Therefore, we still consider that Protonitidula neli is a unique nitidulid, which has some ancestral traits similar with Kateretidae, and occupies a basal placement in Nitidulidae, close to Kateretidae (ZHAO et al. 2022). Spinanitidula nigrumflavo differs from P. neli in the following characters: big and oval body, complete elytra, compact antennal club, strongly declined head (ZHAO et al. 2022).

Besides, Spinanitidula nigrumflavo can be distinguished from Phenolia (Palaeoronia) haoranae by strongly declined head, pronotum transverse with unparallel and narrowly explanate lateral margin, longest metaventrite (KIREJTSHUK et al. 2023). In addition, spine arrangement in Spinanitidula nigrumflavo gen. and sp. nov. is different from that in So. angustipes and P. neli: there are two rows of spines in protibiae, and four rows of spines in meso- and metatibiae in Spinanitidula gen. nov., while there is one row of spines in all tibiae in P. neli, and two rows of spines in meso- and metatibiae in So. angustipes (KIREJTSHUK & CHETVERIKOV 2018; ZHAO et al. 2022). Spine arrangement on tibiae of Phenolia (Palaeoronia) haoranae lacks clearly description, therefore it is difficult to compare the spine arrangement of tibiae between Phenolia (Palaeoronia) haoranae and Spinanitidula nigrumflavo (JELÍNEK et al. 2010).

Only two genera and four species are currently preserved in compressed fossil in Cretaceous, including Crepuraea archaica, Crepuraea explanate, Crepuraea zherichini, Cyllolithus mirandus (KIREJTSHUK & PONOMARENKO 1990). And, Spinanitidula is different from the two genera Crepuraea and Cyllolithus in: prosternal process broad with parallel sides, widely separated mesocoxae, trapezoidal pronotum with broadest base equaling to combined elytral width (KIREJTSHUK & PONOMARENKO 1990). The four nitidulid species mentioned above are poorly preserved (KIREJTSHUK & PONOMARENKO 1990), so that clearer comparison of tibiae in
Spinanitidula nigrumflavo with those from Crepuraea and Cylolithus cannot be made.

The most remarkable characters in the fossil, which is not known in any nitidulids are the protibiae armed with one row of spines on the outer edge and another one in the inner edge together with the meso- and metatibiae wrapped by four rows of spines on the outer lateral edge, in addition to rows of setae on all tibiae. It is common for extant nitidulids that protibiae are armed by outer lateral spines, and that 1–3 rows of spines are located on dorsolateral edge of meso- and metatibiae, but there are few records about inner spines on protibiae or over 3 rows of dorsolateral spines on meso- and metatibiae (JELÍNEK et al. 2010; LAWRENCE & ŚLIPIŃSKI 2013). As for the reported nitidulid fossils that described the distribution of setae on tibiae, there are at most two rows of small short spines or rows of setae on their tibiae, and even setae may be absent on protibiae, e.g.,

Cybocephalus balticus (KIREJTSHUK 2011; KIREJTSHUK & CHETVERIKOV 2018; KIREJTSHUK & KUROCHKIN 2010; KIREJTSHUK & NEL 2008; KIREJTSHUK & POINAR 2007; KUROCHKIN & KIREJTSHUK 2010). Given the above comparison and the peculiar distribution pattern of spines on tibiae, we tentatively place Spinanitidula nigrumflavo in the extant subfamily Nitidulinae.

5. Conclusion

The fossil record of Nitidulidae in Burmese amber is limited. In this study, we describe a new genus and species of sap beetles, which is distinguished by its protibiae armed with a single row of spines on the outer and another one in the inner edges, and meso- and metatibiae with four rows of spines on the outer lateral edge. Through a comparative study of Spinanitidula nigrumflavo with the 10 extant subfamilies except Nitidulinae, and a detailed discussion of its differences from various tribes of Nitidulinae, we propose that the new species should be classified as a new genus, tentatively in Nitidulinae. Our discovery enriches the morphological diversity of Nitidulidae in the mid-Cretaceous.
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Fig. 1. Photomicrographs of *Spinanitidula nigrumflavo* gen. and sp. nov. from the Cretaceous Burmese amber; under normal reflected light (holotype, NIGP-202798). A, dorsal view. B, ventral view. Scale bars: 1 mm.
Fig. 2. Morphological details of *Spinanitidula nigrumflavo* gen. and sp. nov. from the Cretaceous Burmese amber (holotype, NIGP-202798). A, dorsal view of head, under normal reflected light. B, labrum, under confocal laser scanning microscopy (CLSM). C, procoxal cavity, under CLSM. D, prosternal process, under CLSM. E, abdomen, under normal reflected light. F, pygidium, under
CLSM. Abbreviations: a1, antennomeres 1; cy, clypeus; ey, eye; fe, femur; he, head; lb, labrum; ma, mandible; pp, prosternal process; py, pygidium; v1–5, ventrite 1–5. Scale bars: 500μm in A, 200 μm in B, C, D, 1mm in E, and 100 μm in F.
Fig. 3. Photomicrographs about ventral head and protarsi of *Spinanitidula nigrumflavo* gen. and sp. nov. from the Cretaceous Burmese amber (holotype, NIGP-202798); most under confocal laser scanning microscopy (CLSM), except A under normal reflect light. A, ventral view of head. B, antennae. C, mentum. D, protarsi. Abbreviations: a1–10, antennomeres 1–10; cl, claw; ey, eye; ma, mandible; mt, mentum; smt, submentum; sp, spur; ts 1–5, tarsomeres 1–5. Scale bars: 500 μm in A; 200 μm in others.
Fig. 4. Photomicrographs about legs of *Spinanitidula nigrumflavo* gen. and sp. nov. from the Cretaceous Burmese amber (holotype, NIGP-202798); under confocal laser scanning microscopy (CLSM). A, lateral view of protibia. B, lateral view of mesotibiae. C, dorsal view of mesotibia. D, lateral view of metatibiae. E, mesotarsi. F, tarsal claw. Abbreviations: cl, claw; si, spine; sp, spur; ts1–5, tarsomeres 1–5. Scale bars: 100 μm in F; 200 μm in others.