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Short communication

The first unusual Hemerobiidae (Neuroptera) from mid-Cretaceous Burmese amber

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ABSTRACT

Hemeroberotha sinefurca gen. et sp. nov. (Neuroptera: Hemerobiidae) is described from mid-Cretaceous Burmese amber. It is particularly remarkable for its very short 19-segmented antennae, the apically obtuse terminal segment of the maxillary palpus, the single RP in the forewing, all femora covered with very long thick setae, and elongated (mainly paired) setae on the ventro-distal margins of its tarsomeres. The genus *Hemeroberotha* probably represents a specialized side branch of basal hemerobiids.

1. Introduction

The family Hemerobiidae is rather speciose, ca. 520 extant valid species in 27 genera (Oswald, 2018), and are cosmopolitan in distribution. About 25 species of fossil Hemerobiidae have been described from the Late Jurassic to the Miocene (pers. data). They are relatively common in the Cenozoic; however, only four to five species have been described from the Cretaceous: *Purbemerobius medialis* Jepson et al. (2012) from the late Berriasian of the Durlston Formation; *Cretomerobius disjunctus* Ponomarenko (1992) from the Early Cretaceous of Mongolia; *Plesiorobius sibiricus* Makarkin (1994a) from the Cenomanian of northeastern Russia; *Plesiorobius canadensis* Klimaszewski and Kevan (1986) from Campanian Canadian amber; and *Plesiorobius* cf. *canadensis* from Santonian Taymyr amber, northern Siberia (Makarkin, 1994a). In addition, there is an undescribed species from Turonian New Jersey amber (Makarkin et al., 2016). The family affinity of *Protohemerobius perexiguus* Jepson et al. (2009) from the Barremian (Upper Weald Clay) of England is unclear due to poor preservation, but it may belong to Hemerobiidae.

Further Hemerobiidae were reported from mid-Cretaceous Burmese amber by Makarkin (2016b) without details. Here, we describe the first new genus and species of the family based on a single specimen from this amber, which is remarkable for some characters.

2. Material and methods

This study is based on single specimen of Hemerobiidae embedded in a piece of Burmese amber (20 mm long), without syninclusions. Some portions of the specimen show postmortem deformation: the head is flattened dorso-ventrally and the abdomen is much deformed.

Burmese amber is found in the Hukawng Valley in the state of Kachin in northern Myanmar. A map is provided by Grimaldi et al. (2002, fig. 1). The precise mine from which this piece originated is not known, as it was acquired from a fossil trader. The age of Burmese amber is currently considered to be earliest Cenomanian (Shi et al., 2012; Smith and Ross, 2018).

Photographs were taken by CG using a Zeiss stereomicroscope (modified with variable objectives: NikonMPlan 5×, 10×, 20×, 40×; ZEISS Luminar 18 mm, 25 mm, 40 mm) and an attached Canon EOS 450D digital camera. Line drawings were prepared by VM using Adobe Photoshop CS3.

The venational terminology follows Makarkin et al. (2016).

Abbreviations: AA1–AA3, first to third Anterior Analis; CuA, Anterior Cubitus; CuP, Posterior Cubitus; MA and MP, anterior and

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posterior branches of the Media; ORBs, oblique radial branches; ORB1, proximal-most oblique radial branch; RA, Anterior Radius; RP, Posterior Radius; RP1, proximal-most branch of RP; RP2, branch of RP distad RP1; ScP, Posterior Subcosta.

3. Systematic palaeontology

Order Neuroptera Linnaeus, 1758
Family Hemerobiidae Latreille, 1802

Genus ***Hemeroberotha*** gen. nov.
Type and only species. *Hemeroberotha sinefurca* sp. nov.

Derivation of name. From *Hemerobius* and *Berotha*, genus-group names of Neuroptera, referring to the resemblance of the forewing venation of this genus to that of some Berothidae and Hemerobiidae. Gender feminine.
Diagnosis. Antennae very short, 19-segmented; terminal segment of maxillary pulpus relatively short, rounded apically; all femora covered with very long setae; first to fourth tarsomeres bear two-three long setae on ventro-distal margin. In both fore-, hind wings, ScP, RA widely spaced distally; all subcostal veinlets simple; RP single; only one (outer) gradate series of crossveins in radial space. In forewing, humeral veinlets recurrent, branched; CuP deeply forked. In hind wing, CuP present, simple.

Hemeroberotha sinefurca sp. nov.
Figs. 1–4

Derivation of name. From the Latin *sine*, without, and *furcus* [*-a*, *-um*], forked, referring to all subcostal veinlets in the forewing being not forked.
Type material. Holotype no. 11275, currently deposited in the collection of Carsten Gröhn. His collection will be separately deposited in the museum of the Geological-Paleontological Institute and Museum of the University of Hamburg [Geologisch-Paläaontologisches Institut und Museum der Universität Hamburg] (now Centrum of Natural History [Centrum für Naturkunde]). A complete male (?) specimen.
Type locality and horizon. Burmese amber (Northern Myanmar: Kachin State: Myitkyina District: Tanai Township: Hukawng Valley). Upper Cretaceous: Lowest Cenomanian.
Description. Head appears flattened and elongated (Figs. 2A–C). Vertex covered with elongated, rather thick scarce setae. Ocellar

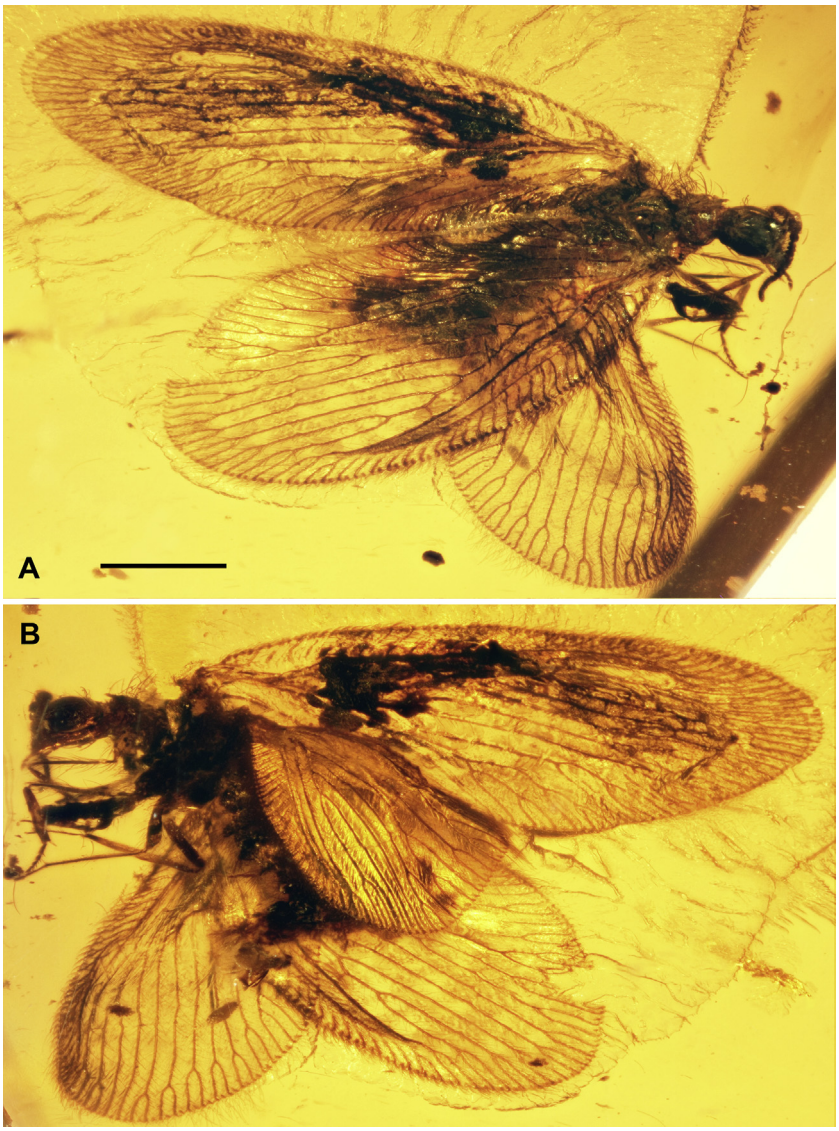

Fig. 1. *Hemeroberotha sinefurca* sp. nov., holotype no. 11275, specimen as preserved. A, dorso-lateral right view; B, lateral (left) view. Scale bar represents 1 mm (both to same scale).

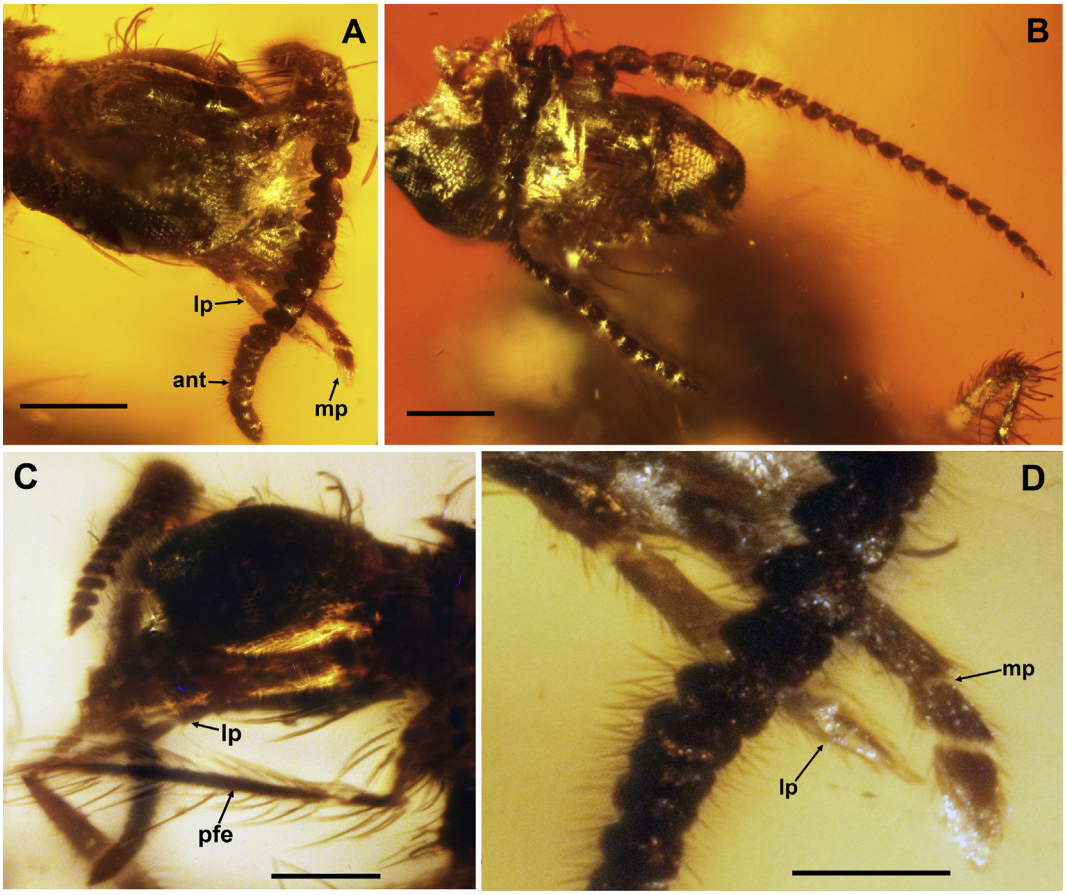

Fig. 2. Head and appendages of *Hemeroberotha sinefurca* sp. nov., holotype no. 11275. A, head, dorso-lateral right view; B, head, frontal view; C, head, ventro-lateral left view; D, left palpi. ant, antenna; lp, labial palpus; mp, maxillary palpus; pfe, profemur. Scale bars represent 0.2 mm (A–C), 0.1 mm (D).

pulvinae (ocelli-like tubercles) not detected. Eyes appear large, elongated. Antennae very short, 19-segmented, in general thickened; scapus enlarged (0.085 mm high), rounded, nearly as long as wide; pedicellus slightly elongated; proximal flagellomeres rather thick, broad; flagellum narrowed towards apex; terminal segment conical, pointed. Maxillary palpus relatively short, covered with very fine elongated setae; third segment elongated; forth segment short, at least twice shorter than previous; terminal segment relatively short (but longer than forth segment), rounded apically. Labial palpus moderately long, 3-segmented, covered with very fine, elongated setae; second and terminal segments elongated, relatively slender; terminal segment gradually narrowed towards apex, pointed apically. Maxillary, labial palpi without additional terminal sub-segment (Fig. 2D).

Pronotum rather short, transverse, rounded laterally in dorsal view, covered with long, thick, relatively scarce setae. Mesothorax covered dorsally with very long, thick setae.

Legs long, slender (Fig. 3A). Fore-legs: procoxa relatively short, thick, covered with scarce elongated thick setae; profemur long, slender, covered with long dense setae; protibia long, slender, covered with rather short setae; protarsus not visible. Mid-legs: mesocoxa anteriorly covered with very long, dense setae; mesofemur long, slender, covered with long dense setae; mesotibia relatively thick, shorter than mesofemur, covered with short dense setae, with relatively long, paired spurs (Fig. 3B); mesotarsus: first to four mesotarsomeres bear each two long setae on ventro-distal margin; basimesotarsus longest (nearly as long as next two mesotarsomeres together). Hind legs: metafemur long, rather thick, covered with long dense setae; metatibia very long (much longer than metafemur), slender, medially not swollen, covered with dense, short setae, with relatively long, paired spurs; metatarsus: metatarsomeres one to four each bear two-three long setae on ventro-distal margin; basimetatarsus longest (nearly as long as next three metatarsomeres together) (see Fig. 3B).

Forewing 4.2 mm long, 1.7 mm wide. Costal margin appears strongly convex (but perhaps postmortem deformation). Costal space relatively narrow, only slightly dilated proximally. Humeral veinlet recurrent, with four simple branches. Other subcostal veinlets rather closely spaced, simple. Subcostal space relatively broad; basal subcostal crossvein located slightly proximad origin of RP; distal subcostal crossvein poorly discernible. ScP, RA widely spaced distally (Fig. 3C). ScP entering wing margin far from wing apex. Posterior trace of RA forked, with one forked branch. RA space (between RA, RP) with three widely-spaced crossveins. RP originates relatively close to wing base (slightly distad basal subcostal crossvein), with five pectinate branches. Anterior trace of RP, RP2–RP5 once forked; RP1 deeply forked far proximad gradate series of crossveins, both branches once rather deeply forked. M basally not fused with R, forked slightly distad origin of RP1. MA dichotomously branched with three forks; MP similarly branched, but with two forks. Anterior trace of CuA once forked, with two pectinate branches, each once or twice forked. CuP running close to CuA, deeply forked, with anterior branch simple, posterior branch terminally forked. AA1 pectinately branched, with three branches (one forked, two simple); basal-most branch originates

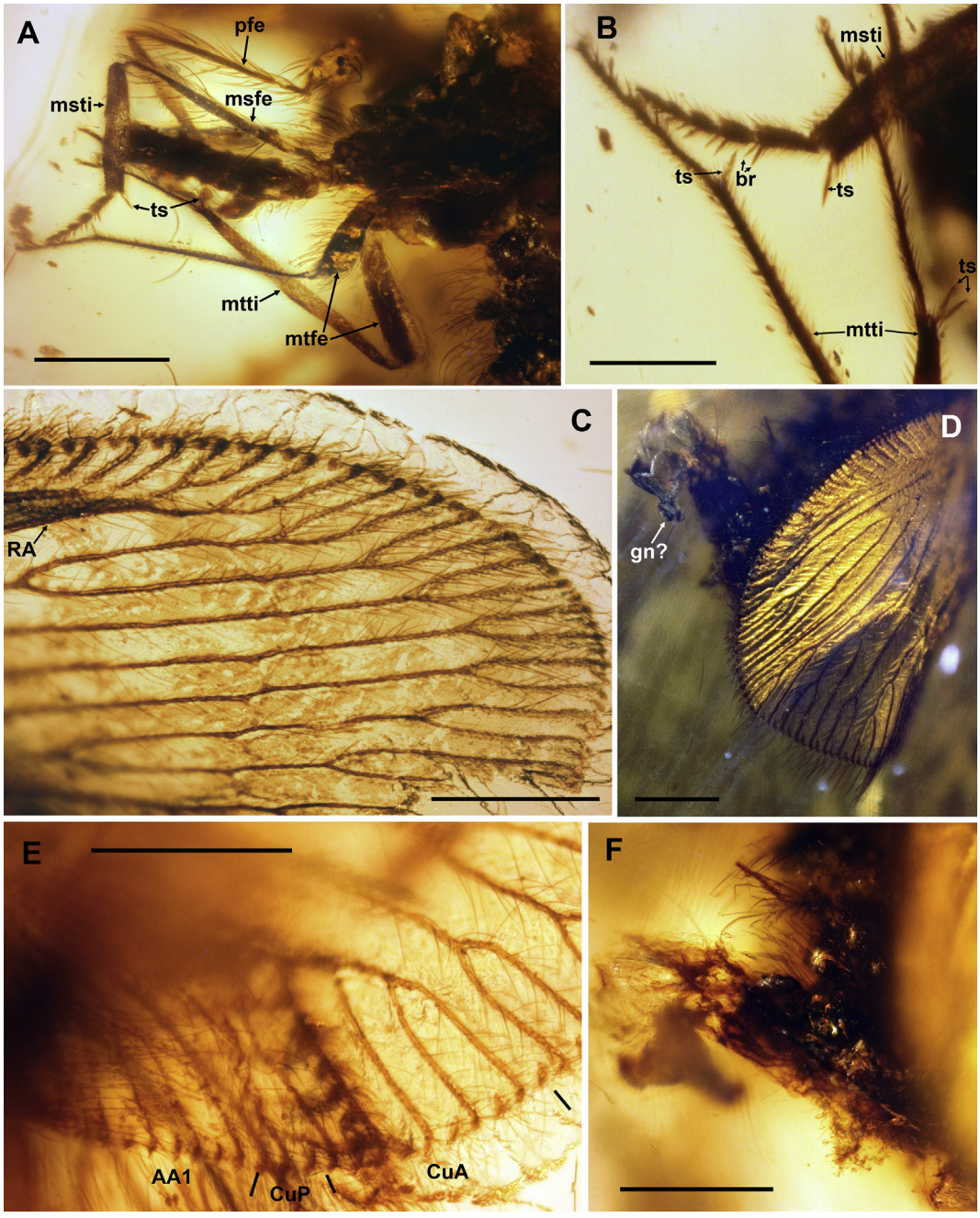

Fig. 3. Details of *Hemeroberotha sinefurca* sp. nov., holotype no. 11275. A, legs; B, tarsi of mid- and hind legs; C, apical portion of right forewing; D, terminal portion of abdomen and apical portion of left hind wing; E, fragment of right hind wing; F, terminal portion of abdomen. br, elongated setae (bristles) on ventro-distal margins of tarsomeres; gn, gonarcus; msfe, mesofemur; msti, mesotibia; mtfe, metafemur; mtti, metatibia; pfe, profemur; ts, tibial spurs. Scale bars represent 0.5 mm (A, C–F), 0.2 mm (B).

at nearly half of length. AA2 rather profusely (in general pectinately) branched with three branches, of which two once-twice forked. Structure of AA3 not clearly discernible. Two gradate series of crossveins discernible: four crossveins of second series connect RP1 and RP2 (poorly discernable), RP1 and MA (rather long), MP and CuA, CuA and CuP (both short); ten crossveins of fourth (outer) series from RA to CuA. Setae on veins and fringe relatively long.

Hind wings partially hidden under forewings, venation of only distal parts well discernible (Figs. 1, 3D, E). Costal space relatively broad. All subcostal veinlets simple. Subcostal space moderately broad; with three poorly-discernible distal crossveins. ScP, RA widely spaced distally. RA once forked distally. RA space appears broaden distally, with two preserved crossveins: proximal one poorly discernible; distal one belongs to outer gradate series. RP single, with five pectinate branches. Anterior trace of RP, RP1 (in both wings), RP2, RP3 (in right wing) once forked; RP2, RP3 (in left wing) twice forked; RP4 and RP5 in both wings not forked. M forked far proximad origin of basal-most branch of CuA. MA dichotomously branched, with three forks; MP once forked. CuA pectinate branched distally, with four relatively long, simple branches. CuP not forked distally. AA1 pectinate branched, with four preserved relatively long, simple branches. AA2, AA3 not visible. Seven preserved crossveins of third (outer) series from RA

to MA. Setae on veins and fringe long, especially along outer and hind margins.

Abdomen very poorly preserved, covered at least ventrally with long setae (Figs. 3A, F). Apical part appears damaged with internal genitalia extruded with structure resembling male gonarcus clearly discernible (Fig. 3D); other details impossibly to interpret.

4. Discussion

4.1. Hemerobiid affinity of Hemeroberotha

The forewing venation of this unusual genus is generally rather typical for Hemerobiidae except the presence of the single RP. However, it also superficially resembles that of Berothidae (especially the Mesozoic Mesithoninae), in particular by the presence of a well-developed recurrent and branched humeral vein (e.g., *Oloberotha sinica* Ren and Guo, 1996, fig. 6). The main synapomorphy of Hemerobiidae according to Garzón-Orduña et al. (2016), which might be detected in this fossil, is not present in *Hemeroberotha*, i.e., the presence of two or more branches of RP, which originate separately on RA. Other synapomorphies of Hemerobiidae identified by these authors are not discernible in this fossil by preservation.

We assign *Hemeroberotha* to the Hemerobiidae mainly by the presence of long tibial spurs (see Fig. 3B, ts) and the venation of the hind wing. In Berothidae, tibial spurs are absent or (rarely) very short and hidden among the terminal setae. The preserved venation of the hind wing is rather typical for Hemerobiidae: CuA and AA1 have long pectinate branches, and CuP is simple. A hind wing similar to that of *Hemeroberotha* is found in the Early Cretaceous *Purbemerobius medialis*, which certainly belongs to Hemerobiidae (see Jepson et al., 2012, fig. 16). In all Berothidae, extant and fossil, including the oldest species from the Middle Jurassic, the branching part of the hind wing CuA is long with short to very short branches (e.g., Ren and and Guo, 1996, fig. 6; Makarkin et al., 2011, fig. 5). This is an important feature of the hind wing of Berothidae.

A similar configuration of the hind wing CuA as found in *Hemeroberotha* is also found in Sisyridae and Dilaridae (i.e., Dilarinae). However, the forewing humeral vein in these families are never recurrent and branched, and their venation differs in many other characters.

The abdomen is poorly preserved and partly damaged, but a structure is clearly discernible that is very similar to the gonarcus of Hemerobiidae (Fig. 3D).

Therefore, the assignment of this unusual genus to other families (e.g., Berothidae, Sisyridae, Dilaridae) is much less likely than to the Hemerobiidae.

4.2. Diagnostic characters of Hemeroberotha

4.2.1. Antennae

Moderately long antennae are characteristic of all hitherto known Hemerobiidae. For example, in Australian Hemerobiidae, the antennae range from 0.6 of body length to slightly longer than body length (New, 1988). These proportions occur also in the vast majority of extant and fossil Hemerobiidae. The least number of antennal segments previously known in the family is in the Baltic amber *Prolachlanius resinatus* (Hagen in Pictet-Baraban and Hagen, 1856), which has 35–39 antennomeres, *Proneuronema minor* Makarkin et al. (2016), with 42, and in the extant *Psectra iniqua* (Hagen, 1859), with 37 antennomeres (Makarkin et al., 2016; pers. obs.). However, even the shortest antennae, those of *P. resinatus* with 35 antennomeres, are relatively long, i.e., they are slightly more than half of body length (pers. obs.). In general, the antennae in all species of *Psectra* Hagen, 1866 have less than 50 antennomeres; e.g., are 44 in *P. mozambica* Tjeder (1961), and ca. 45 in *P. diptera* (Burmeister, 1839) (Killington, 1936; Tjeder, 1961). The antennae of most other genera of Hemerobiidae bear usually 50–70 antennomeres, but species of *Sympherobius* Banks, 1904 often have less than 50 (e.g., 46–47 in the Baltic amber *S. completus* Makarkin and Wedmann, 2009).

Therefore, the very short antennae of *Hemeroberotha sinefurca* with 19 antennomers, which are much shorter than the body, is unusual for the family and certainly a derived condition.

4.2.2. Maxillary and labial palpi

Terminal segments of the maxillary and labial palpi are apically more or less pointed in all extant species of Hemerobiidae, similar to a condition found in the labial palpi of *Hemeroberotha sinefurca* (Fig. 2D, lp). The terminal segment of both palpi is divided into two sub-segments in four subfamilies (i.e., Hemerobiinae, Sympherobiinae, Notiobiellinae and Drepanacrinae: Oswald, 1993a, appendix 5), and the apical sub-segment is apically pointed in these. The apically rounded (obtuse) terminal segment of the maxillary palpus as found in *H. sinefurca* is unknown in extant Hemerobiidae. Among the Mesozoic Hemerobiidae, the palpi are well discernible only in the Canadian amber *Plesiorobius canadensis*; its maxillary palpus is apically pointed. The apically obtuse terminal segment of the maxillary palpus appears to occur in Middle Jurassic taxa, but its shape is not clearly visible in known specimens.

4.2.3. Long setation of the body

All species of Hemerobiidae possess moderately long to short, fine setae on the body and appendages. Very long and rather thick setae on the ventral side of the abdomen (at least), femora, dorsal parts of thorax and head (sparse) are characteristic only of *Hemeroberotha sinefurca*. Similar long setation is also present in many Burmese amber Berothidae, Dilaridae and Sysiridae, which have bodies of comparable size (Makarkin, 2016a, 2017; pers. obs.).

4.2.4. Elongated setae (bristles) on ventro-distal margins of the tarsomeres

The first to fourth tarsomeres on the ventro-distal margin of at least the mid- and hind legs in *Hemeroberotha sinefurca* bear two or three elongated setae (bristles) (Fig. 3B, br). Other Hemerobiidae often possess several thick bristles on this margin of each of the first to fourth tarsomeres, which however are much shorter, and are assumed to be used in cleaning the antennae and palpi (Killington, 1936, fig. 10B, C). These bristles in known fossil Hemerobiidae (including Jurassic) are hardly discernable; if present, they are probably short, like in extant taxa. Therefore, the presence of elongate bristles on the ventro-distal margins of the tarsomeres is most probably a derived condition.

4.2.5. Distal parts of ScP and RA

ScP and RA are distally separated in all extant Hemerobiidae, except for *Adelphohemerobius* Oswald, 1994, in which ScP abruptly terminates on RA (see Oswald, 1994, fig. 1, Monserrat, 1997, fig. 16). On the contrary, these veins are distally fused in all Mesozoic taxa (including undescribed) except for *Hemeroberotha sinefurca* and *Purbemerobius medialis*.

4.2.6. Single stem of RP in the forewing

A single stem of RP in the forewing is only found in the Cretaceous *Hemeroberotha* and *Plesiorobius* among described Hemerobiidae. This condition is also present in undescribed Middle Jurassic taxa and in another undescribed species from Burmese amber (VM, pers. obs.). In all other known species, RP is represented by at least two separate stems, which Oswald (1993a) denominated 'oblique radial branches' (ORBs).

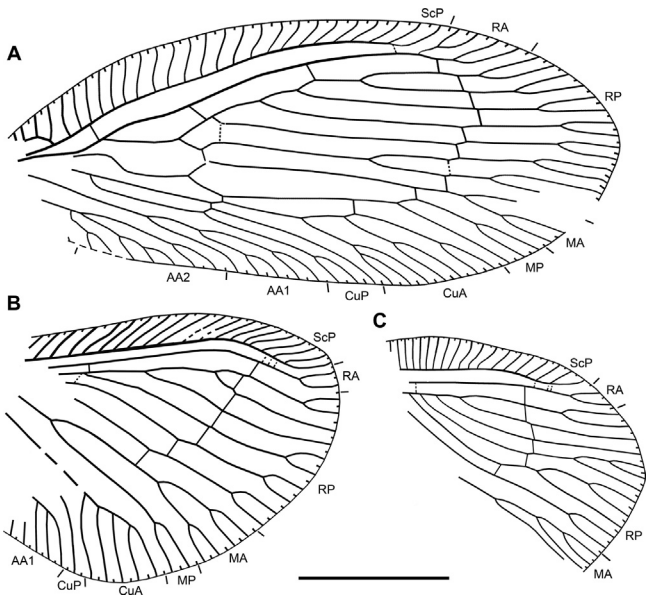

Fig. 4. Wing venation of *Hemeroberotha sinefurca* sp. nov., holotype no. 11275. A, right forewing; B, right hind wing; C, left hind wing. Hind wings' shapes in Figures B and C are distorted due to their orientation. Scale bar represents 1 mm (all to same scale).

The number of forewing RP's in the extant South American genus *Adelphohemerobius* is disputable, one or two. Oswald (1994) believed that the holotype of the Chilean *Adelphohemerobius enigmaramus* Oswald (1994) possesses a single RP, whereas Garzón-Orduña et al. (2016) interpreted its RP as having two ORBs. Monserrat (1997) assigned "*Pirionus*" *anomalus* González Olazo (1993) from Argentina to this genus, but its male genitalia and forewing venation (although the latter was very inaccurately drawn; see González Olazo, 1993, fig. 17) showed that this species is more similar to those currently considered in *Megalomus* Rambur, 1842 than to *Adelphohemerobius*, e.g., *Megalomus nigratus* (Navás, 1929). In particular, the forewing of the holotype of *P. anomalus* bears four or five ORBs, and ScP and RA are distally widely separated, character states which strongly differ from those of *A. enigmaramus*. Monserrat (1997, fig. 16) provided a photograph of the wings of another female from Chile, identified by him as '*Adelphohemerobius anomalus* prob.', which is however certainly not conspecific with the holotype of *Pirionus anomalus*. The venation of this female is similar to that of *A. enigmaramus*, and it probably represents a second (unnamed) species of the genus. It differs from *A. enigmaramus* mainly in that the forewing RP consists of two distinct stems (ORBs), a deeply forked ORB1 and a pectinate ORB2, both originating near to the wing base. Therefore, we may agree with Garzón-Orduña et al.'s (2016) interpretation of the forewing RP in *Adelphohemerobius*, i.e., that it possesses two stems of RP, and ORB1 (RP1) is deeply forked, once (unnamed species) or twice (the holotype of *A. enigmaramus*).

Therefore, all extant species of Hemerobiidae have two or more separate stems of RP, and the single RP may be found only in fossil taxa. The latter condition is certainly plesiomorphic as it is present in the vast majority of neuropteran families, including the oldest.

4.2.7. Simple subcostal veinlets in the forewing

Zachobiella Banks, 1920 is the only genus within the family in which all subcostal veinlets are simple (see e.g., Oswald, 1993a, fig. 124; Makarkin, 1994b, fig. 6). All other genera have at least several forked veinlets, and most subcostal veinlets are forked one or more times in the majority of its species, including all others from the Mesozoic (both described and known undescribed). The condition found in *Hemeroberotha* and *Zachobiella* is obviously derived, and it might have evolved independently in these genera.

4.2.8. Outer gradate series of crossveins in the forewing

At least two gradate series of crossveins in the radial space of the forewing ('inner' or series 3, and 'outer' or series 4) are present in most extant Hemerobiidae, i.e., all genera of Drepanepteryginae, Drepanacrinae, Megalominae, Sympherobiinae, Microminae, most genera of Hemerobiinae, and *Notherobius* New, 1988 of Carobiinae. Of these, the additional series 2 (proximad series 3) are present in some genera (e.g., *Drepanepteryx* Leach, 1815 and *Neuronema* McLachlan, 1869). An inner and outer series are present in most fossil genera, e.g., *Cretomerobius* Ponomarenko, 1992, *Plesiorobius* Klimaszewski and Kevan, 1986, *Proneuronema* Makarkin et al., 2016, and *Prolachlanius* Krüger, 1923. The additional series 2 occurs in *Cretomerobius*.

Crossveins in the radial space of *Neosympherobius* Kimmins, 1929 are absent.

A single gradate series is present in *Carobius* Banks, 1909 (Carobiinae), *Notiobiella* Banks, 1909 (Notiobiellinae), *Psectra*, *Anapsectra* Tjeder, 1975, *Zachobiella* (both Zachobiellinae), and *Biramus* Oswald, 1993b (Hemerobiinae). Of these, the outer gradate series is retained in *Carobius* and the inner gradate series in the other genera. Therefore, *Hemeroberotha* is most similar to the Australian genus *Carobius* by this character state, which is probably derived and might have evolved independently in these genera.

Interestingly, all extant genera which possess one gradate series in the forewing are currently distributed almost exclusively in tropical and subtropical regions (except for the Holarctic *Psectra diptera*).

4.2.9. Configuration of CuA in the hind wing

The hind wing CuA is slightly smoothly curved and all its branches are simple in *Hemeroberotha*. This vein is abruptly bent (to a greater or lesser extent) at the origin of CuA1 in all extant and Cenozoic Hemerobiidae (see e.g., Makarkin et al., 2016, fig. 2D, 8C). All branches of the hind wing CuA are forked at least once in all extant and Cenozoic Hemerobiidae, except the extant genera *Psectra* and *Anapsectra* Tjeder, 1975, in which these branches are simple, apart from the forked CuA1. In the undescribed Middle Jurassic taxa, the Cretaceous *Purbemerobius medialis* and *Plesiorobius canadensis*, the hind wing CuA is smoothly curved, but its branches are simple only in *P. medialis* and once forked in the others. The smoothly curved hind wing CuA is probably a plesiomorphic condition in the family, but its simple branches are a derived state.

4.3. Systematic position of Hemeroberotha

Four fossil genera of Hemerobiidae have been hitherto described from the Mesozoic, one from the Late Jurassic and three from the Cretaceous. The monotypic Jurassic genus *Promegalomus* Panfiliov, 1980 is represented by the only forewing from Karatau, Kazakhstan. The Cretaceous genera are *Purbemerobius* Jepson et al., 2012, *Cretomerobius* and *Plesiorobius* (see species list and their localities in Introduction). Of these, *Purbemerobius* is represented only by a hind wing, *Cretomerobius* only by a forewing, and *Plesiorobius* by both fore- and hind wings: the forewing of *P. canadensis* is nearly completely and rather well preserved, its hind wings are poorly discernible; *P.* cf. *canadensis* is known by the distal part of a forewing; *P. sibiricus* is poorly preserved and its venation is only partially visible.

All fossil hemerobiid genera from the Cainozoic (i.e., *Proneuronema*, *Prolachlanius*, *Prospadobius* Krüger, 1923, and *Bothromicromus* Scudder, 1878) belong to extant subfamilies and are in general very similar to extant genera.

This analysis indicates that *Hemeroberotha* is very distantly related to any of these fossil and all extant genera, and certainly does not belong to any known subfamilies. Its mixture of primitive and advanced character states is noteworthy. Some do not occur in Cenozoic or extant taxa, but occur in some Mesozoic species, e.g., the single stem of RP; the primitive structure of the hind wing CuA and possibly of the apically obtuse terminal segment of the maxillary palpus. On the other hand, several striking derived conditions are present in *Hemeroberotha*, e.g., the simple subcostal veinlets in the forewing; only one gradate series of crossveins in the radial space in both wings; the extremely short antennae; long, relatively thick setae on the femora; and elongated setae on the ventro-distal margins of the tarsomeres.

The single RP of *Hemeroberotha* is certainly a symplesiomorphic character state in Hemerobiidae, i.e., an ancestral condition shared by some Mesozoic genera of the family. *Hemeroberotha* differs from all these taxa by its distally separate ScP and RA (distally fused in them), and by the advanced conditions of other characters. We do not know any hemerobiid genus whose morphology can be compared with that of *Hemeroberotha*. This stem group genus likely represents a specialized side branch of some basal hemerobiids.

5. Conclusions

Hemeroberotha sinefurca gen et sp. nov. is the first known member of Hemerobiidae from Burmese amber. It is remarkable for several character states, especially its very short 19-segmented antennae and the single RP in the forewing. This unusual genus most probably represents a specialized side branch of basal Hemerobiidae.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cretres.2019.104206.