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THE FOSSIL SPIDER FAMILY LAGONOMEGOPIDAE IN CRETACEOUS AMBERS WITH DESCRIPTIONS OF A NEW GENUS AND SPECIES FROM MYANMAR

David Penney: Earth, Atmospheric and Environmental Sciences, The University of Manchester, Manchester, M13 9PL, United Kingdom. E-mail: david.penney@manchester.ac.uk

ABSTRACT. The spider family Lagonomegopidae was described a decade ago from two specimens in Upper Cretaceous Siberian amber from the Taimyr Peninsula, and placed in the superfamily Palpimanoidea. Lagonomegopidae is known only from Cretaceous amber. Undiscovered extant species are considered unlikely because of their frequent occurrence in Cretaceous ambers and their absence in Tertiary fossil resins. One aim of this paper is to bring the existence of this family to the attention of neo-arachnologists. *Burlagonomegops eskovi* new genus and species is described from Cretaceous amber of Myanmar (Burma) and *Lagonomegops americanus* new species is assigned to a previously described, but unnamed specimen from Cretaceous New Jersey amber.

Keywords: Burma, Mesozoic, paleontology, Palpimanoidea

It is seldom the case that systematists working on extant spiders acknowledge the existence of fossil spiders in published papers on their particular group of interest. However, this is not universal and I am encouraged by the increased frequency with which reference to fossils now occurs. The 21st European Colloquium of Arachnology, Russia 2003, hosted the first special symposium dedicated to paleoarachnology (see Logunov & Penney 2004), which was well attended. It is often true that fossil spiders preserved in shales and other sediments can be difficult, if not impossible to place in the framework of higher level extant spider taxonomy and systematics. However, this is not always the case with amber-preserved spiders. Marusik & Penney (2004) noted that fossil and Recent arachnological taxonomy cannot be considered as totally independent disciplines. The importance of considering fossils became evident when the fossil genus *Archaea* Koch & Berendt 1854, first described from Baltic amber (and placed in Archaeidae, a new family erected for the fossils) was shown to be a senior synonym of the extant genus *Eriauchenius* O. Pickard-Cambridge 1881 (originally placed in Theridiidae) described from Madagascar by Simon (1895). More recently, the new name *Theridion sulawesiense* Marusik & Penney 2004 was erected for the extant spider species *T. simplex* Thorell 1877 from Sulawesi because that name was preoccupied by *T. simplex* Koch & Berendt 1854 from Baltic amber.

Fossil spiders in Cenozoic ambers have been known for centuries. The first major work with formal descriptions appeared in the mid nineteenth century (Koch & Berendt 1854). In contrast, it was only a decade ago that the first spider inclusion in Mesozoic amber was described, by Eskov & Wunderlich (1995) of Santonian age from Siberia. However, it is only within the last few years that new descriptions of Cretaceous amber spiders have been published, for example in fossil resins of Turonian age from New Jersey (Penney 2002, 2004*a*), Barremian age from the Isle of Wight (Selden 2002), Upper Neocomian–basal Lower Aptian age from Lebanon (Penney & Selden 2002; Penney 2003a; Wunderlich & Milki 2004 [not 2001 as cited by Poinar & Milki 2001]), Albian age from Myanmar (Penney 2003b, 2004b) and Campanian age from Canada (Penney 2004c). Spiders have been listed as present (and occasionally figured) in Mesozoic amber faunas from Canada (McAlpine & Martin 1969), the Caucasus (Eskov & Wunderlich 1995), France (Schlüter 1978; Néraudeau et al. 2002; Perrichot 2004), Álava, Spain (Alonso et al. 2000) and Asturias, Spain (Arbizu et al. 1999) but none of these have yet been formally described.

The enigmatic spider family Lagonomegopidae was first described by Eskov & Wunderlich (1995) from two specimens in Upper Cretaceous Siberian amber from the Taimyr Peninsula, and placed in the superfamily Palpimanoidea based on the presence of peg teeth, the absence of teeth on the cheliceral promargin, the trichobothrial pattern and the spineless legs. Penney (2002) described an additional specimen from New Jersey amber as *Lagonomegops* sp. indet. and Penney (2004c) described *Grandoculus chemahawinensis* Penney 2004 from Canadian amber. Wunderlich (2004) provided the same figures and descriptions of the specimens originally described by Eskov & Wunderlich (1995). Platnick's (2004) catalog did not include fossil taxa and the publications in which this fossil family is described may not be immediately obvious (or available) to some arachnologists, because one is a private journal published in Germany, two are paleontological and the fourth is a privately published book. The main aim of this paper is to bring to the attention of the arachnological community the existence of the enigmatic spider family Lagonomegopidae, which is currently only known from amber, but which may have undiscovered extant species in the southern hemisphere, as in the Archaeidae mentioned above. In addition, new specimens are described for the first time from Cretaceous amber of Myanmar (Burma).

METHODS

Material.—Two specimens preserved in Burmese amber (burmite) (for details of locality and stratigraphy, see Zherikhin & Ross [2000], Grimaldi et al. [2002], Cruickshank & Ko [2003]) held in the Department of Entomology at the American Museum of Natural History (AMNH). AMNH Bu–707 is preserved in a small piece (4 × 3 × 3 mm) of clear yellow–orange amber with no syninclusions, but with numerous small air bubbles; AMNH Bu–1353 is preserved in a small piece (9 × 5 × 5 mm) of clear yellow–orange amber containing several fracture planes and a male Diptera (Microphorinae) syninclusion.

Methods.—Prior to being received by the author the amber had been set in a clear plastic resin and cut and polished to reveal the inclusions. All measurements were made using an ocular graticule and are in mm. Drawings were done under incident light with a *camera lucida* attached to an Olympus SZH stereomicroscope and photographs were taken with a Nikon D1X digital camera attached to a Wild M8 stereomicroscope.

Abbreviations used in the figures.—a = air bubble, ab = abdomen, car = carapace, L/R 1–4 = left and right walking legs 1–4, p = pedipalp, s = spine, t = trichobothrium.

SYSTEMATIC PALEONTOLOGY

Remarks.—It is appreciated that fossil spiders are taxonomically subequal to the extant fauna (Eskov 1990) and the certainty with which pattern-based species can be recognized in the fossil record is less than that for extant organisms (Smith 1994).When I described the second known occurrence of the family Lagonomegopidae, from New Jersey amber (Penney 2002), I was reluctant to diagnose it as a species and refrained from naming it. However, given the recent discovery that this family represents a regular component of Cretaceous faunas from several geographically distinct amber deposits, I feel it is now justifiable to place the specimens within a provisional taxonomic framework. Unfortunately all specimens identified to date are immature. The genitalia are unknown for this family so the taxonomy is based on somatic characters.

Superfamily Palpimanoidea

Remarks.—See Penney (2004c) for a discussion of the systematic placement of Lagonomegopidae in this superfamily.

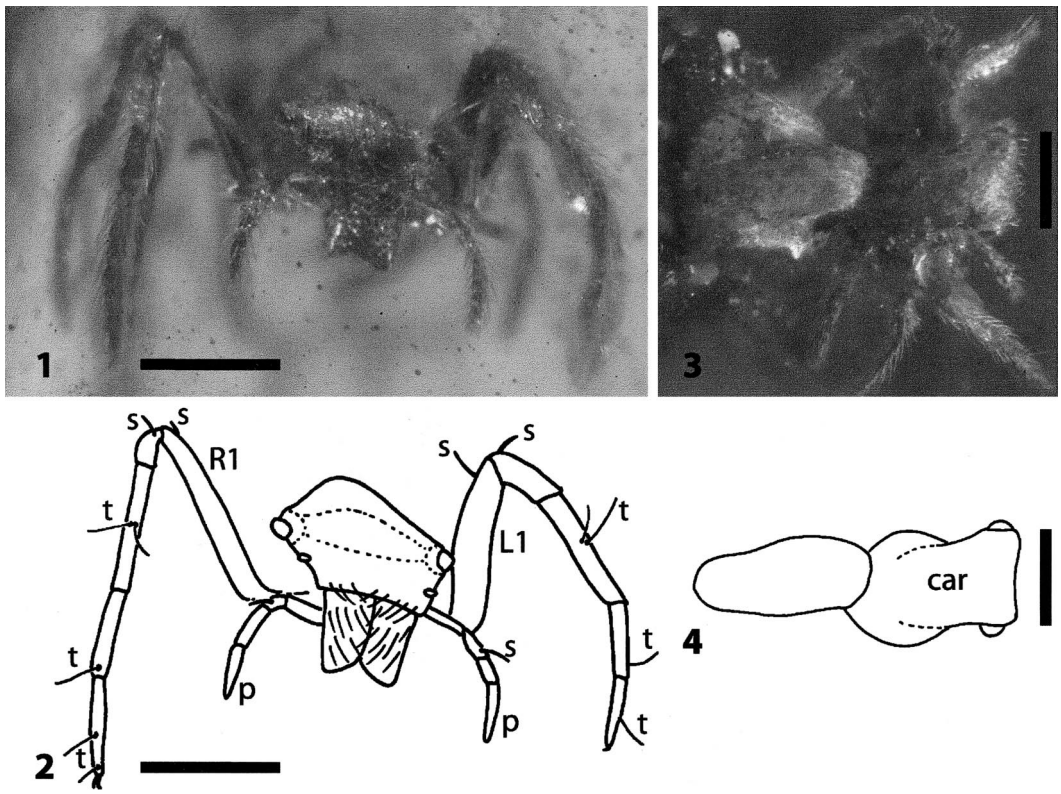
Family Lagonomegopidae Eskov & Wunderlich 1995

Distribution.—Fossil species in Cretaceous ambers from Siberia, New Jersey, Myanmar and Canada. Recent species not known.

Lagonomegops Eskov & Wunderlich 1995

Type species.—*Lagonomegops sukatchevae* by original designation and monotypy. Holotype, juvenile, PIM 3311/564, held in the Paleontological Institute of the Russian Academy of Science, Moscow. Not examined because the current location of these specimens within the PIM collections is unknown (K. Eskov pers. comm. 2004).

Distribution.—Fossil species in Cretaceous ambers from Siberia and New Jersey. Recent species unknown.



Figures 1–4.—*Burlagonomegops eskovi* new species. Holotype, AMNH Bu–707, juvenile, Burmese amber. 1, 2. anterior view. 3, 4. dorsal view. 3–4. Scale lines = 0.5 mm

Lagonomegops americanus new species

Lagonomegops sp. indet.: Penney 2002: 711, pl. 1 fig. 2, text-fig. 2.

Material examined.—Holotype juvenile, U.S.A.: New Jersey amber, 1995, K. Luzzi (AMNH NJ–556 (KL–297)).

Diagnosis.—*Lagonomegops americanus* can be distinguished from *L. sukatchevae* by the possession of the following combination of characters: tarsi longer than metatarsi, a single dorsal spine distally on femur 1.

Etymology.—The specific epithet is after America, the provenance of the fossil.

Distribution and age.—New Jersey amber; Turonian, Upper Cretaceous (Grimaldi et al. 2000).

Burlagonomegops new genus

Type species.—*Burlagonomegops eskovi* new species.

Etymology.—*Bur* derived from Burma, the former name of Myanmar, and *lagonomegops*, the type genus of the family.

Diagnosis.—*Burlagonomegops* differs from the other genera in this family by having the carapace distinctly longer than wide and in possessing tarsal trichobothria.

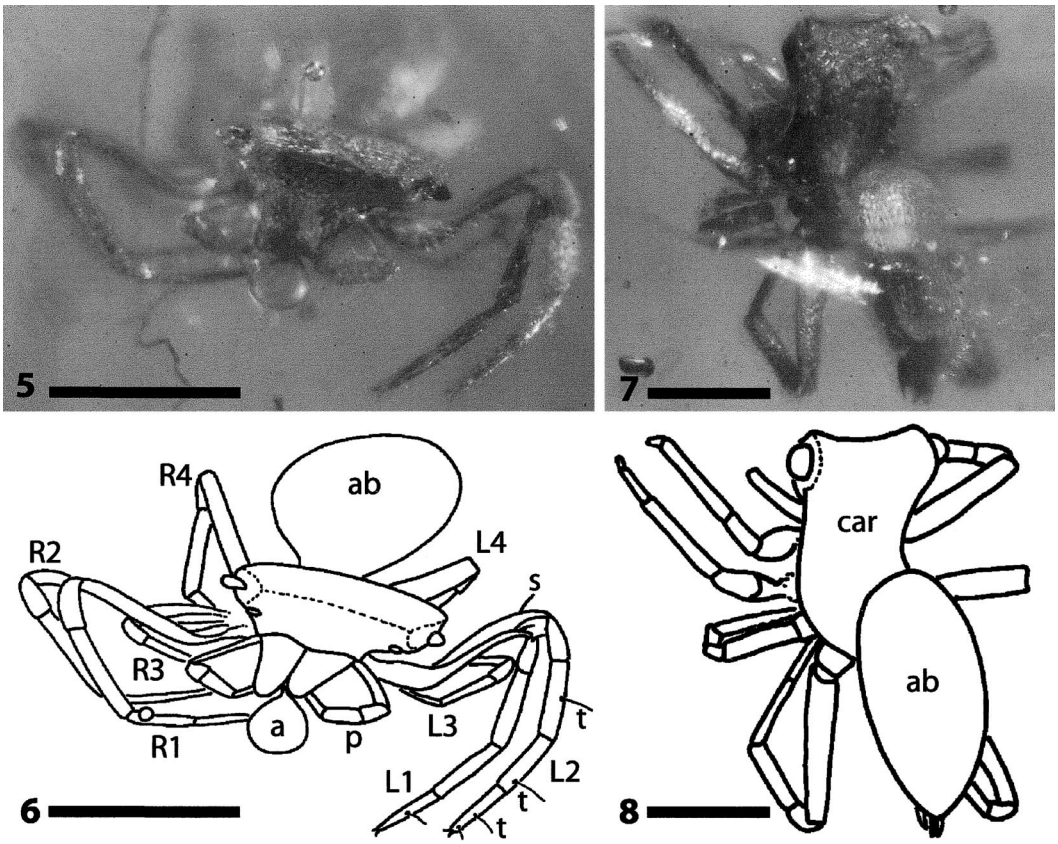
Description.—See description of the type species below.

Distribution.—Fossil species in Cretaceous amber from Myanmar. Recent species not known.

Burlagonomegops eskovi new species
Figs. 1–8

Lagonomegopidae: Grimaldi et al. 2002: 29, fig. 18e (AMNH BU–707).

Material examined.—Holotype juvenile, Burmese amber, MYANMAR, Kachin: Tanai Village (on Ledo Road 105 km NW of Myitkyna), 2000, by the Leeward Capitol Corporation (AMNH Bu–707). Paratype: 1 juvenile, same data as holotype (AMNH Bu–1353).



Figures 5–8.—*Burlagonomegops eskovi* new genus and species. Paratype, AMNH Bu–1353, juvenile, Burmese amber. 5, 6. anterior view. 7, 8. dorsal view. Scale lines = 0.5 mm.

Etymology.—The specific epithet is a patronym in honor of Dr. Kirill Eskov (Paleontological Institute, Moscow) in recognition of his contributions to paleoarachnology and his audible joy and excitement upon first viewing the paratype under a microscope.

Diagnosis.—As for genus.

Description (based on both holotype and paratype).—Body length 1.8; carapace 0.8 long, 0.5 wide between the eyes when viewed dorsally. With distinct, long setae, sides rounded in the thoracic region, cephalic region distinct and with a slightly procurved anterior edge (Figs. 3–4), lacking a fovea. Two large eyes, situated in flank positions anteriorly (Figs. 1–8). When viewed anteriorly, distance between clypeal margin and a hypothetical line joining these eyes at their centres 0.2; a second pair of smaller eyes are located midway between the large eyes and the end of the clypeal margin (Figs. 2, 6), width of clypeal margin 0.4, with long, curved setae projecting inwards from both sides. Chelicerae twice as long as wide, with long setae projecting downwards, not possible to determine whether peg-teeth are present or absent. Sternum 0.4 long, 0.3 wide between coxae 2, truncate anteriorly and with sparse, long setae. Fang short, unmodified, labium as long as broad, maxillae longer than broad and converging. Opisthosoma oval (Figs. 3–4, 7–8), 1.0 long, 0.4 wide; spinnerets unmodified and in a compact group at the distal tip (Figs. 7–8).

Leg formula unknown because neither specimen is preserved in a manner conducive to making accurate measurements, all segments setose. Legs 1 and 2 appear approximately equal in length, 2.0, leg 4 may be slightly longer and leg 3 is distinctly shortest. Leg spines thin and week, visible dorso-distally on femora 1, 2 and 4 and the patellae of the pedipalp and legs 1, 2 and 3. Trichoboth-

ria: tibia 1 with paired (tibiae 2–4 with at least one), each metatarsus with one long in the distal half and each tarsus with one long median and one short distal (Figs. 2, 6). Tarsi with three claws.

Remarks.—Although both preserved in Burmese amber, each specimen appears to have undergone different diagenetic/taphonomic processes, to such an extent that at first sight they appear to be quite different from one another. The best preserved specimen is the holotype, the paratype seems to have undergone some somatic distortion in carapace shape anteriorly and in the legs, which appear thin, stretched and twisted. In addition, the majority of setae have not been preserved in the paratype.

Distribution and age.—Burmese amber, Myanmar (Burma); Albian, Lower Cretaceous (Cruickshank & Ko 2003).

DISCUSSION

The known geological range of lagonomegopids now spans approximately 25 Ma, from 100 Ma Burmese amber into the Campanian (Canadian amber; Penney 2004c). The younger end of the known range is 75 Ma, shortly before the Cretaceous–Tertiary (K/T) boundary dated at 65 Ma. This boundary marks the mass extinction event that wiped out the dinosaurs and numerous other groups. Spider inclusions in Tertiary ambers are extremely common and the lack of Lagonomegopidae in these fossil resins, when considered against their frequent occurrence in Mesozoic resins, suggests they may have become extinct during this event, in contrast to many other spider families which survived it (Penney et al. 2003). However, undiscovered extant species of Lagonomegopidae may exist, as was suggested by Eskov & Wunderlich (1995), but their absence in Tertiary resins makes this unlikely. It is more probable, given the general habitus and frequent occurrence of lagonomegopids in Cretaceous ambers that they occupied a similar niche to the Recent Salticidae (the most species-rich family today), which are extremely frequent in Tertiary ambers but have not been described from the Cretaceous. Thus, the lagonomegopids may represent a primitive lineage which gave rise to the Salticidae or they may have been ecologically replaced by them. The discovery of mature lagonomegopids with clearly visible genitalia should help resolve this problem and confirm or reject their superfamilial placement in Palpimanoidea.

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