Preface Cretaceous ecosystems trapped in amber

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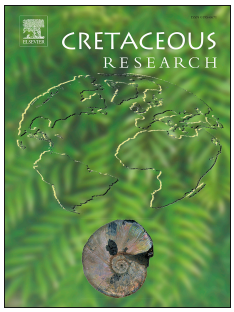

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Preface：Cretaceous ecosystems trapped in amber

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Amber-bearing deposits are among the most important Konservat-Lagerstätten, providing unique windows into ancient terrestrial ecosystems. Several new amber biotas have been discovered recently from which various sometimes specialized and bizarre looking animals and plants have been reported; these discoveries naturally attract the attention of palaeontologists, palaeoecologists, biologists, and, most certainly, the public at large. Moreover, research based on amber has greatly developed in the past decade and is becoming increasingly multidisciplinary with the application of new methodology and approaches (e.g., μCT imaging, integrative phylogeny), increasing the importance of amber inclusions in broader evolutionary studies.

This special issue of *Cretaceous Research* contains 13 papers that reflect some of the latest advances in the study of various aspects of the ancient ecosystems preserved in Cretaceous ambers. Exceptional plant and animal fossils are reported or reviewed, with insights into the novel morphological and ecological functions they reveal. The papers encompass 10 insect orders, including Blattodea (cockroaches), Coleoptera (beetles), Hymenoptera (wasps), Neuropterida (Neuroptera (lacewings), Megaloptera (alderflies) and Raphidioptera (snakeflies)), Odonata (dragonflies), Tarachoptera (extinct insects) and Trichoptera (caddisflies). A particular focus is made on the abundant, extraordinary Kachin (Burmese) amber biota which has been extensively studied in the past decade, providing invaluable advances towards our understanding of evolutionary patterns on a tropical Tethyan island. Most papers also compare and contrast the past diversity offered by various Cretaceous amber deposits worldwide, including those from the Lower Cretaceous of the Middle East (Lebanon and Jordan), England, Spain and Myanmar (Hkamti); the mid- to Upper Cretaceous of France; and

the Upper Cretaceous of Russia (Taimyr), Azerbaijan, USA (New Jersey), Canada and Myanmar (Tilin). These all augment the 8 species in 5 genera newly described from mid-Cretaceous Kachin amber.

Thus Peris (2020) reviews all Cretaceous amber Coleoptera and shows how beetles are a useful tool for studying community and trophic structure as well as generating evolutionary implications for the whole ecosystem. Additionally, Wu et al. (2022) report the first occurrence of the Lucaninae (Coleoptera; stag beetles) from mid-Cretaceous Kachin amber, suggesting an origin and early diversification of the subfamily before the Late Cretaceous. Zhao et al. (2021) review the termites (isopteran Blattodea) and related inclusions in Cretaceous amber, with insights into their early eusociality, feeding habits and associates (termitophiles), demonstrating their significance for understanding the termites' early evolution, ecology and behaviour. Zheng (2021) describes a new hemiphlebiid damselfly and further clarifies the position of 11 odonatans of previously equivocal familial assignment, all from Kachin amber. Wichard and Mey (2021) review the extinct order Tarachoptera, which is exclusively confined to inclusions in Burmese amber. By summarizing all tarachopterans, they provided an emended diagnosis of the order and establish its placement within the superorder Amphiesmenoptera, also including Lepidoptera (butterflies) and Trichoptera. Luo et al. (2021) briefly discuss the internal taxonomy of the beetle-like extinct family Umenocoleidae (actually related to cockroaches) in which they report a new genus and species based on a well-preserved specimen from Kachin amber. Wichard (2021) provides an overview of the Trichoptera in Kachin amber, providing taxonomic clarification of 10 Cretaceous caddisfly families. Furthermore, Wichard (2021) and Wang et al. (2021) report four new species in three genera of caddisflies. Away from panorpoids, Lu and Liu (2021) give a review of our present knowledge of the systematics, phylogeny, and palaeoecology of Neuropterida from Kachin amber, and also provide a world checklist and faunal analysis of other Cretaceous amber Neuropterida, highlighting a significantly higher Cretaceous diversity of this now archaic (and charismatic) insect group. Rasnitsyn and Öhm-Kühnle (2021) review the non-aculeate (non-eusocial) hymenopterans and suggest that a major infraordinal transformation took place during the first half of the Late Cretaceous based on the gradual loss of extinct families in successive amber assemblages.

In addition to the highly diverse insect taxa in amber deposits, Ostracoda (seed

shrimps) and Jungermanniopsida (liverworts) are also discussed in this issue. Piovesan et al. (2022) report several ostracods encapsulated in a Brazilian Cretaceous amber sample, representing the oldest ostracods preserved in a fossil resin. Palynological analyses of amber-containing limestones of the Crato Formation (Araripe Basin, Northeastern Brazil) suggest that the extinct coniferous Family Cheirolepidiaceae was the possible botanical source of this fossil resin. Based on two newly discovered and exquisitely preserved gametophytes in Kachin amber, Li et al. (2021) provide a detailed investigation and re-appraisal of two previously described species of Frullaniaceae (leafy liverwort family). Last but not least, Feldberg et al. (2021) review all other currently recognized leafy liverwort species (Jungermanniopsida) from Cretaceous ambers and provide a useful key, as well as describing a new species from Kachin amber.

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