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Editorial

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Preface: Mesozoic arthropods: biodiversity, palaeoecology, and biostratigraphy

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Biodiversity today displays a unique distribution, with 85% of plant and animal species thriving on land, particularly in tropical rainforests. However, the foundations for this terrestrial biodiversity were laid during a transformative period, the Late Cretaceous-early Palaeogene (Angiosperm Terrestrial Revolution, Benton *et al*., 2022). This era witnessed an explosive boost in terrestrial diversity, resetting the Earth-life system on land and elevating the biosphere to unprecedented levels of productivity. At the heart of this ecological renaissance were the arthropods, particularly the Hexapoda—a terrestrial arthropod lineage characterized by six legs. The Mesozoic represents a key period for the rise of the extant arthropod fauna, with insects playing a central role in catalyzing the Angiosperm Terrestrial Revolution. This critical period saw innovations in angiosperm biology and evolutionary ecology, including the development of efficient reproductive strategies and coevolutionary relationships with animals, especially pollinators and herbivores (Benton *et al*., 2022; Peña-Kairath *et al*., 2023). Arthropods, with insects as a prominent group within the Hexapoda, were integral to this revolution, contributing to the diversification of terrestrial environments and the establishment of complex ecological interactions (Grimaldi & Engel, 2005).

Insects, constituting over half of all described animal species, underwent significant evolutionary events during the Mesozoic. The rise of holometabolous insects, the origin of eusocial and parasitic insects, and the diversification of pollinating insects are among the noteworthy milestones (*e.g*., Cai *et al*., 2017, 2018; Barden *et al*., 2020; Tihelka *et al*., 2021a; Wang *et al*., 2022). The discovery of exceptional fossils in the past two decades has provided robust evidence for insect-plant and insect-insect ecological interactions, contributing to our understanding of today's ecosystems and biodiversity. In addition, advancements in sequencing technologies and genome-scale data for hexapods have significantly altered our understanding of the origin and evolutionary history of insect biodiversity (Misof *et al*., 2014; Tihelka *et al*., 2021b). The exponential growth of genetic information has provided a deeper insight into the genetic underpinnings of diverse insect traits and behaviours. The integration of genomic data with the fossil record enhances our understanding of the role arthropods played in the Mesozoic and the assembly of extant biodiversity (Tihelka *et al*., 2021b; Cai *et al*., 2022).

In this special issue of *Zootaxa*, we present a collection of research articles focusing on Mesozoic arthropods, including arachnids, 'conchostracans,' hexapods (mainly insects), and myriapods. The known palaeodiversity of organisms entombed in mid-Cretaceous Burmese amber (northern Myanmar) has increased dramatically over the past decade (Ross, 2019, 2020, 2021, 2022, 2023). The fidelity of amber preservation of soft tissues and nano-scale structures sheds lights onto the functional morphology, palaeoecology and behaviour of Mesozoic insects (*e.g*., Cai *et al*., 2020). Wang *et al*. (2023) describe a new genus and species of japygids (Diplura) from the mid-Cretaceous amber of northern Myanmar (Kachin amber). The new taxon exhibits distinctive features in abdominal segment X and cerci, providing new insights into the evolutionary history of this ancient and poorly-explored lineage of arthropods. Insects are undoubtedly the most biodiverse lineage of terrestrial arthropods in the Mesozoic. Mesozoic insects have been well-known from exceptional faunas such as the Middle–Late Triassic Tongchuan biota (Shaanxi Province, northwestern China; Zheng *et al*., 2018), the Middle–Late Jurassic Yanliao biota (Hebei, Inner Mongolia, and Liaoning provinces, northeastern China; Lin, 1976; Hong, 1983; Huang *et al*., 2018; Lian *et al*., 2021), and mid-Cretaceous amber from northern Myanmar (Ross, 2019, 2020, 2021, 2022, 2023). In this issue, Fu & Huang (2023) describe a new genus and species of the extinct cicadomorphan family Hylicellidae (Hemiptera) based on a forewing from the Triassic Tongchuan biota. The discovery represents the earliest Triassic hylicellids from China, shedding

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light on the diversity of cicadomorphan insects in the Mesozoic. Lian *et al*. (2023) document a new species of *Thaumatomerope* (Mecoptera: Thaumatomeropidae) from the Tongchuan biota. Thaumatomeropidae is an enigmatic family previously known exclusively from the Triassic Madygen entomofauna of Kyrgyzstan. This finding not only broadens our understanding of paleobiodiversity and the geographic distribution of the Thaumatomeropidae but also provides additional evidence affirming the close relationship between the Madygen and Tongchuan entomofaunas. The Yanliao biota can be distinctly divided into early and late assemblages, with an unclear initial stage (Huang, 2019). Despite only a few insect species being described from the Yan'an Formation (*e.g*., Zheng *et al*., 2017), they clearly exhibit a relationship with those from the Yanliao entomofauna. Huang (2023) describes a new Thripida species from the Middle Jurassic Yan'an Formation, providing additional evidence for the origin of Yanliao biota. Lü *et al*. (2023) document a new species of *Poljanka* (Hemiptera: Protopsyllidiidae) from the Middle Jurassic Daohugou biota, and the diagnosis of *Poljanka* is revised. Progonocimicids are one of key representatives from the Middle–Late Jurassic Daohugou biota, the early assemblage of the Yanliao biota. Xu & Huang (2023) describe a new progonocimicid species of the genus *Cicadocoris* from the Middle Jurassic Jiyuan Basin (central China). It suggests that the coleorrhynchan assemblages in the Middle Jurassic varied significantly between North China and South China. During the Middle Jurassic, the ancient Qinling and ancient Dabie mountains, in conjunction with the ancient Kunlun Mountain, underwent further uplift, collectively forming a substantial mountain chain. This mountainous terrain served as a natural boundary influencing palaeogeography and palaeoclimate between North China and South China. Huang *et al*. (2023) unveil, for the first time, stem-anisopteran dragonflies from the Yangshuzhuang Formation at the Jiyuan Basin. These fossils exhibit notable affinities with taxa found in the Karatau entomofauna of Kazakhstan. Notably, these groups exhibit a gradual decline and were subsequently succeeded by more 'modern' clades of Anisoptera during the Late Jurassic. Diverse compression fossils and amber bioinclusions of insects from Lebanon have been received extensive attention in recent years (*e.g*., Maksoud & Azar, 2020, 2021). Azar & Nel (2023) describe the first representative of the family Tipulidae (Diptera) from the Early Barremian dysodile of Jdeidet Bkassine, South Lebanon. This find indicates that *Leptotarsus* was widely distributed during the Early Barremian. The study of exceptional bioinclusions in mid-Cretaceous Burmese amber has become a hot topic in palaeontological research, and the progress in non-destructive photography methods (*e.g*., micor-CT and Confocal Laser Scanning Microscopy) has significantly transformed the study of amber inclusions (Fu *et al*., 2021; Li *et al*., 2022). Azar & Huang (2023) show a rare case of a mating pair of *Palaeoparasycorax globosus* (Diptera: Psychodidae) from the mid-Cretaceous Burmese amber. The preservation of a mating pair in Burmese amber allows for a deeper comprehension of the sexual dimorphism and sexual behaviour of this Mesozoic species. Similarly, Hakim *et al*. (2023) report the first discovery of barklice (Psocodea) preserved *in copula* from the mid-Cretaceous Burmese amber. This discovery documents the oldest preserved reproductive behaviour of Psocodea, providing insights into the evolution of copulatory behaviour in Trogiomorpha. Using fluorescence and confocal laser scanning microscopy, Li *et al*. (2023b) describe and illustrate a new species of *Burmalestes* Tomaszewska & Ślipiński (Coleoptera: Endomychidae) from mid-Cretaceous amber of northern Myanmar. The discovery provides important information on the morphological variability of this genus.

Despite being less common than insects, non-insect arthropods have also been well known in Burmese amber. Xuan *et al*. (2023) describe a new protoischnurid fossil within the genus *Cretaceoushormiops* (Arachnida: Scorpiones) from Burmese amber. This discovery contributes to the understanding of the palaeodiversity and morphological variation of this genus during the Cretaceous period. Su *et al*. (2023) introduce a new millipede species belonging to the extant genus *Propolydesmus* (Myriapoda: Diplopoda), based on multiple specimens of both sexes from the Burmese amber. The application of confocal laser scanning microscopy and X-ray micro-computed tomography has revealed intricate morphologies of the new species, demonstrating that the genus underwent minimal morphological changes since the mid-Cretaceous. In addition, Chen & Yin (2023) present a second, better-preserved specimen and provide additional morphological details of *Euroleptochromus tuberculatus*, a species occurring in the Eocene Baltic amber. The fossil exhibits distinctly clearer and more detailed ventral features, facilitating a precise interpretation of its morphology.

Clam shrimps, also known as 'conchostracans,' constitute a paraphyletic group of large bivalved crustaceans that inhabit shallow continental waters globally. Numerous Mesozoic taxa have been documented, and they are regarded as crucial indicators in non-marine sediments, offering significant stratigraphic, palaeogeographical, and palaeoenvironmental insights due to their rapid evolution, exceptional environmental adaptability, and extensive distribution (Li, 2021, 2022; Teng, 2022). Liao *et al*. (2023) detail a new spinicaudatan species of *Triglypta* discovered

in the Upper Jurassic Maao Formation (Jiyuan Basin, Henan Province, China) and highlight its biostratigraphic implication. Its striking similarity to *T. jianchangensis* from the Upper Jurassic Tiaojishan Formation in western Liaoning Province suggests a correlation between the Maao Formation and the Tiaojishan Formation in western Liaoning. Furthermore, the Middle–Upper Jurassic in the Jiyuan Basin may host distinctive early and late 'conchostracan' assemblages, akin to those observed in the Yanliao area.

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