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Fossil Mecoptera of China: A review and taxonomic checklist

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Abstract

The study of fossil Mecoptera in China started relatively late, with the first mecopteran fossil species not reported until 1980. With the increasing number of palaeoentomological researchers in China and the discovery of several important fossil localities, studies on fossil Mecoptera have made considerable progress. This paper provides a comprehensive review of the research history on fossil Mecoptera in China and presents a taxonomic checklist of all known Chinese species. It also provides a taxonomic checklist of Chinese fossil Mecoptera, including 170 species belonging to 65 genera and 17 families from the Permian to the Cretaceous. Overall, although considerable progress has been achieved in the study of fossil Mecoptera in China over the past half century, further fossil discoveries and studies are still required to clarify their diversity, stratigraphic distribution, and evolutionary history.

Keywords: scorpionflies, fossil insects, Chaohu City, Yinping Formation, entomofauna

Introduction

Mecoptera, commonly known as scorpionflies, are among the oldest holometabolous insect orders, with a fossil record dating back to the early Permian (Rasnitsyn *et al*., 2004). The fossil diversity of Mecoptera is far richer than that of extant taxa, with more than 40 families, over 200 genera, and more than 700 species reported to date (*e.g*., Ren *et al*., 2019; Soszyńska-Maj *et al*., 2022). In contrast, extant mecopterans exhibit relatively low diversity, with only nine families and approximately 800 species currently known (Bicha, 2018; Wang & Hua, 2022). Owing to their key phylogenetic position in the evolutionary framework of Holometabola, Mecoptera have long attracted considerable attention from entomologists and have been studied extensively (*e.g*., Whiting, 2002; Beutel *et al*., 2019; Tihelka *et al*., 2020).

China has yielded abundant and diverse fossil insects, among which Mecoptera constitute a considerable component. However, compared with other insect groups, studies on fossil Mecoptera in China began relatively late and have been reported mainly over the past few decades. With the discovery of several important entomofaunas and the expansion of palaeoentomological research teams, research on fossil Mecoptera in China has progressed rapidly.

The present paper reviews the research history of fossil Mecoptera in China, summarizes their stratigraphic distribution, and provides a taxonomic checklist of all known Chinese fossil species. In addition, the diversity of Mecoptera and their distribution among the major fossil insect assemblages are briefly discussed, with the aim of summarizing the fossil record of Mecoptera in China and providing a reference for future research.

Results

Research history of fossil Mecoptera in China

The study of insect fossils in China began relatively late compared with that in other countries. In 1923, Amadeus William Grabau reported several insect species from the Lower Cretaceous Laiyang Formation of Shandong Province, representing the earliest research on insect fossils from China (Grabau, 1923). Study on fossil Mecoptera in China commenced even later. In 1980, Qibin Lin reported the *Orthophlebia yaojiashanensis* (Orthophlebiidae) from the Laocun Formation of Zhejiang Province, marking the first unequivocal fossil record of Mecoptera in China (Lin, 1980).

By the late 20th century, systematic studies of fossil Mecoptera had begun in China. Qibin Lin reported

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mecopteran fossils from several strata in China, including the Zhiluo Formation (Middle-Upper Jurassic) of Shaanxi Province (Lin, 1982), the Hanshan Formation (Middle Jurassic) of Anhui Province (Lin, 1985), the Shiti Formation (Middle Jurassic) of Guangxi (Lin, 1986), and the Huangshanjie Formation (Upper Triassic) of Xinjiang (Lin, 1992). Youchong Hong published a series of studies on Jurassic mecopterans from northern China, including material from the Xiahuayuan Formation (Lower to Middle Jurassic) (Hong, 1985) and the Jiulongshan Formation (= Longmen Fm., Middle Jurassic) of Hebei Province (Hong, 1983), as well as the Tuchengzi Formation (= Houcheng Fm., Upper Jurassic-Lower Cretaceous) of Beijing City (Hong & Xiao, 1997).

In the 1990s, Dong Ren conducted further studies on Mesozoic Mecoptera from northern China, reporting abundant species from the Haifanggou Formation (Middle Jurassic) and the Yixian Formation (Lower Cretaceous) of Beipiao City, Liaoning Province (Ren, 1993, 1997), as well as the Lushangfen Formation (Lower Cretaceous) of Beijing City (Ren *et al*., 1995). Haichun Zhang described numerous species of "Orthophlebiidae" from the Xiaoquangou Group (Upper Triassic) and the Badaowan Formation (Lower Jurassic) of Xinjiang (Zhang, 1996). In addition, Junfeng Zhang reported a species of Cimbrophlebiidae from the Lower Cretaceous Fengjiashan Formation in Shaanxi Province (Zhang, 1993).

In the twenty-first century, research teams devoted to fossil insects in China have expanded considerably, and studies of Mecoptera have progressed rapidly. In the early twenty-first century, the research group of Youchong Hong conducted a series of studies on mecopterans from the Tongchuan entomofauna of the lower part of Yanchang Formation (late Middle Triassic) in Tongchuan City, Shaanxi Province (Hong *et al*., 2002a, b; Guo & Hong, 2003; Hong, 2005, 2007, 2009). These studies established the Tongchuan entomofauna as one of the most species-rich Triassic mecopteran entomofaunas. The research team led by Dong Ren has conducted nearly two decades of research on mecopterans from the Daohugou Biota, describing numerous new species and providing evidence for possible co-evolution between long-proboscid scorpionflies and gymnosperms (Ren *et al*., 2009; Qiao *et al*., 2013; Wang *et al*., 2013; Cao *et al*., 2016; Lin *et al*., 2016; Zhang *et al*., 2021). The team of Diying Huang reported mecopterans from several entomofaunas and formations, including the Tongchuan entomofauna (Lian *et al*., 2022c, 2023a, b, 2024a; Lian, 2025b), the Daohugou entomofauna (Lian *et al*., 2021d), and the Jehol entomofauna (Lian, 2025a), as well as from the Middle Jurassic Yangshuzhuang Formation of Jiyuan City, Henan Province (Lian, 2024), the Middle Jurassic Yan'an Formation of Yan'an City, Shaanxi Province (Lian *et al*., 2024b), the Late Jurassic Tiaojishan Formation of Hebei Province (Lian *et al*., 2021b), and the Lower Jurassic (?) Xiaofengmidinzi Formation of Jilin Province (Lian *et al*., 2020). Notably, this research group has described numerous mecopteran species from the Guadalupian Yinping entomofauna, greatly enriching the previously sparse record of Permian Mecoptera in China (Lian *et al*., 2022a, b, 2023c, 2025).

The research team of Haichun Zhang also reported a few mecopteran fossils from the Daohugou Biota and the Yangshuzhuang Formation (Zhao *et al*., 2019; Xu *et al*., 2025).

Stratigraphic distribution of fossil Mecoptera in China

Fossil mecopterans in China have been reported predominantly from Mesozoic strata (Fig. 1). However, mecopterans were already diverse and abundant during the Permian (*e.g*., Martynova, 1948; Martynova, 1961; Novokshonov, 1997). Permian mecopterans in China are known only from the Yinping Formation (Guadalupian) of Chaohu City, Anhui Province. The Triassic mecopterans occur mainly in the lower part of the Yanchang Formation (Chang-7 Member; referred to by some authors as the Tongchuan Formation) in Tongchuan City, Shaanxi Province (*e.g*., Hong, 2005; Hong *et al*., 2002a). In addition, a few specimens have been reported from the Upper Triassic Huangshanjie Formation and the Xiaoquangou Group of Xinjiang (Lin, 1992; Zhang, 1996).

Mecopterans were particularly diverse during the Jurassic, and their fossils have been reported from various regions of China (*e.g*., Hong, 1983; Lian *et al*., 2021a). Among these, the Daohugou Biota of the Middle Jurassic Haifanggou Formation in Inner Mongolia represents one of the most famous Konservat-Lagerstätten in China. Additional Jurassic occurrences include the Lower Jurassic (?) Xiaofengmidinzi Formation of Jilin Province (Lian *et al*., 2020), the Lower Jurassic Badaowan Formation of Xinjiang (Zhang, 1996; Zhang *et al*., 2023), the Middle Jurassic Shiti Formation of Guangxi (Lin, 1986), the Lower Jurassic Menkoushan Formation of Jiangxi Province (Huang *et al*., 1991), the Lower-Middle Jurassic Xiahuayuan Formation of Hebei Province (Hong, 1985), the Middle Jurassic Hanshan Formation of Anhui Province (Lin, 1985), the Middle Jurassic Kezilenur Formation of Xinjiang (Hong, 1983), the Middle Jurassic Haifanggou Formation of Liaoning Province (Lian *et al*., 2021a), the Middle-Upper Jurassic Zhiluo Formation of Shaanxi Province (Lin, 1982), the Upper Jurassic Tuodian Formation of Yunnan Province (Zhang *et al*., 2003), and the Upper Jurassic-Lower Cretaceous Tuchengzi Formation of Beijing City (Hong & Xiao, 1997).

During the Cretaceous, mecopterans began to decline, and fossil records are restricted to a few Lower Cretaceous strata, including the Dabeigou Formation

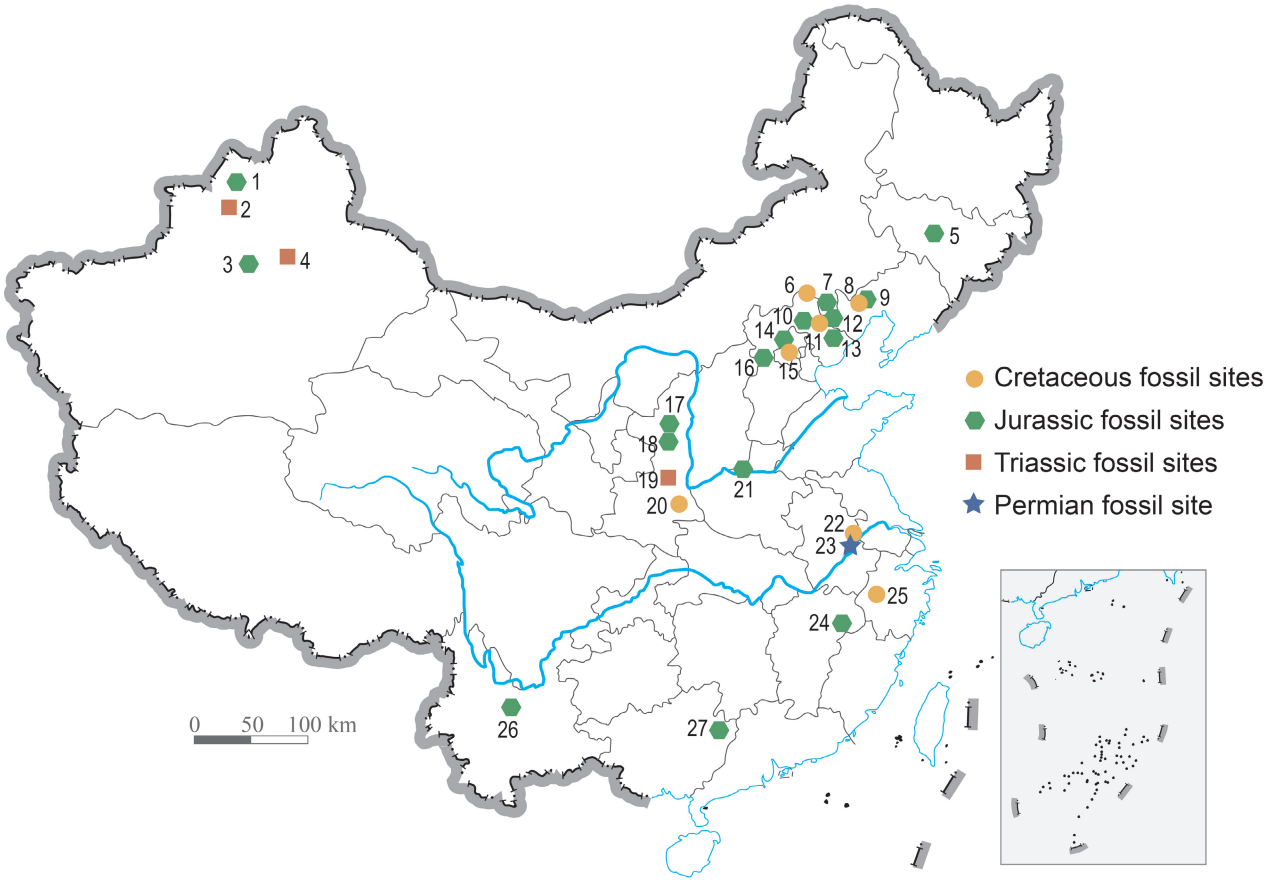

FIGURE1. Distribution of Mecoptera fossil sites in China. 1, Karamay, Xinjiang, Badaowan Formation (J_1); 2, Wusu, Xinjiang, Xiaoquangou Group (T_3); 3, Tashidian, Xinjiang, Kezilenur Formation (J_2); 4, Toksun, Xinjiang, Huangshanjie Formation (T_3); 5, Shuangyang, Jilin Province, Xiaofengmidingzi Formation (J_2 ?); 6, Weichang, Hebei Province, Dabeigou Formation (K_1); 7, Daohugou, Inner Mongolia, Haifanggou Formation (J_2); 8, Beipiao, Liaoning Province, Yixian Formation (K_1); 9, Beipiao, Liaoning Province, Haifanggou Formation (J_2); 10, Zhouyingzi, Hebei Province, Jiulongshan Formation (J_2); 11, Chengde, Hebei Province, Yixian Formation (K_1); 12, Xiaofanzhangzi, Hebei Province, Jiulongshan Formation (J_2); 13, Qinhuangdao, Hebei Province, Tiaojishan Formation (J_3); 14, Yanqing, Beijing City, Tuchengzi Formation (Houcheng Formation, J_3–K_1); 15, Xishan, Beijing City, Lushangfen Formation (K_1); 16, Yuxian, Hebei Province, Xiahuayuan Formation (J_{1-2}); 17, Zichang, Shaanxi Province, Zhiluo Formation (J_{2-3}); 18, Yan'an, Shaanxi Province, Yan'an Formation (J_2); 19, Tongchuan, Shaanxi Province, Yanchang Formation (T_2); 20, Shangxian, Shaanxi Province, Fengjiashan Formation (K_1); 21, Jiyuan, Henan Province, Yangshuzhuang Formation (J_2); 22, Hanshan, Anhui Province, Hanshan Formation (J_2); 23, Chaohu, Anhui Province, Yinping Formation (Guadalupian); 24, Yiyang, Jiangxi Province, Menkoushan Formation (J_2); 25, Shouchang, Zhejiang Province, Laocun Formation (K_1); 26, Chuxiong, Yunnan Province, Tuodian Formation (J_3); and 27, Zhongshan, Guangxi, Shiti Formation (J_2).

(Lian, 2025a) and the Yixian Formation (Ren, 1993, 1997; Qiao *et al*., 2012a) of Hebei Province, the Lushangfen Formation of Beijing City (Ren *et al*., 1995), and the Laocun Formation of Zhejiang Province (Lin, 1980).

Cenozoic mecopterans from China are extremely rare, and no formal records have yet been published.

Checklist of Chinese fossil Mecoptera and their major entomofaunas

Over the past four decades, research on fossil Mecoptera in China has achieved significant progress. To date, a total of 17 families (one family incertae sedis), 65 genera, and 170 species have been reported (Appendix 1). The diversity of Chinese Mecoptera varied markedly through geological time, with relatively low diversity in the Permian, an increase in the Triassic, a pronounced peak in the Jurassic, and a subsequent decline in the Cretaceous (Fig. 2). Among the known fossil entomofaunas, the Yinping entomofauna, Tongchuan entomofauna, Daohugou entomofauna, and Jehol entomofauna represent the most diverse Permian, Triassic, Jurassic, and Cretaceous mecopteran entomofauna in China, respectively.

The Yinping entomofauna represents the only Palaeozoic entomofauna in China from which mecopterans have been reported. At present, two families, six genera, and 15 species of Mecoptera have been reported from the

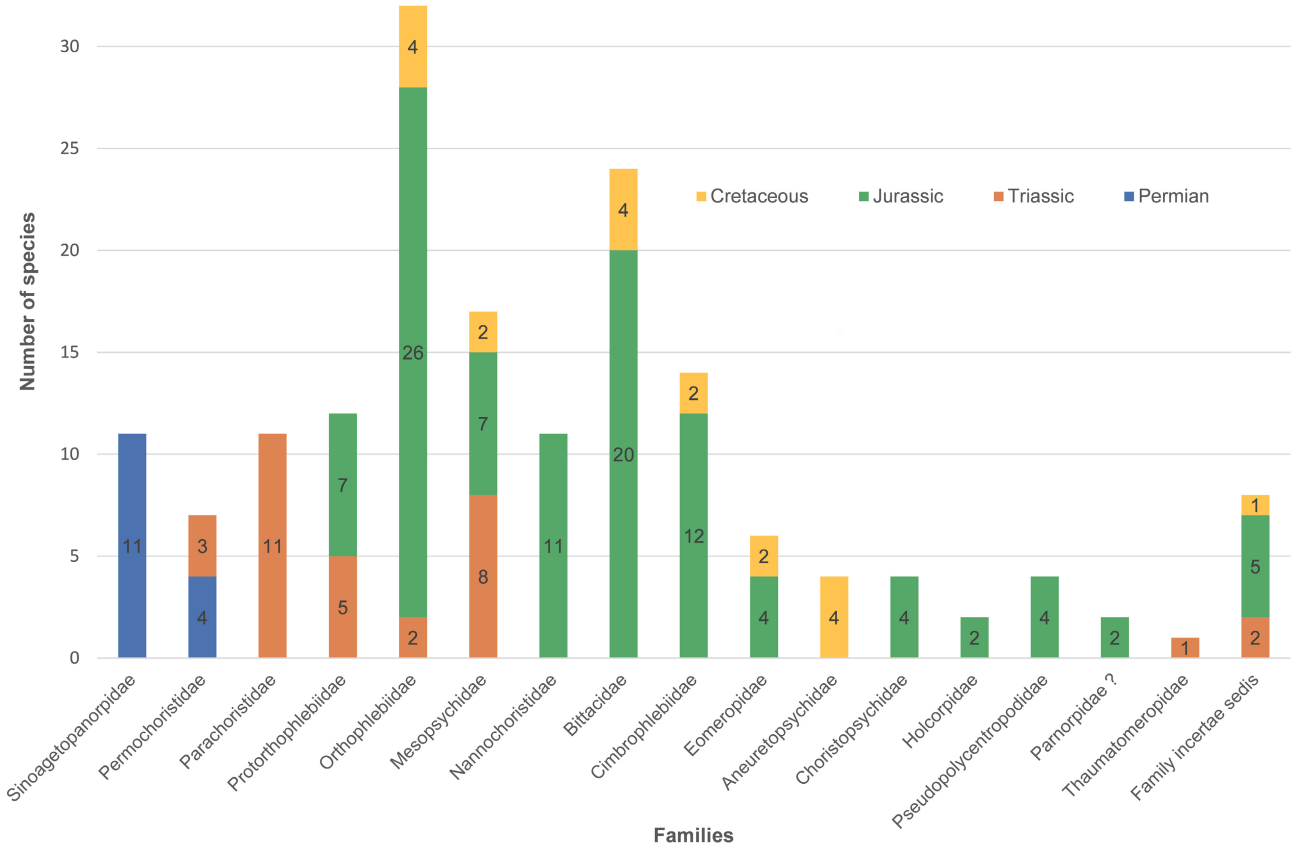

FIGURE 2. Diversity of Chinese Mecoptera through geological time.

Yinping entomofauna. The Yinping entomofauna exhibits a certain degree of regional endemism; for example, taxa such as Signoagetopanorpidae and *Chaohuchorista* are endemic to Chaohu City, Anhui Province. Nevertheless, studies of Permian mecopterans remain at an early stage. Compared with the high diversity of contemporaneous mecopterans reported from other regions of the world, the species richness of Permian Mecoptera in China is still markedly lower, and both fossil collecting and systematic studies require further expansion and refinement.

The Tongchuan entomofauna represents one of the most important Triassic entomofaunas in the world, in which mecopterans constitute one of the most abundant groups (Zhang *et al*., 2022). However, many species reported previously were subject to taxonomic issues; after revision, the Tongchuan entomofauna currently includes seven families, 11 genera, and 26 species of Mecoptera. The composition of mecopterans from the Tongchuan entomofauna is closely similar to that of the contemporaneous Madygen entomofauna of Kyrgyzstan, which is geographically adjacent and of comparable age, thus providing valuable information for stratigraphic correlation.

The Daohugou Biota represents one of the most remarkable Mesozoic faunas in China. The insect fossils from this biota are exquisitely preserved, often revealing extremely fine morphological details. Research on mecopterans from the Daohugou locality has been conducted for nearly two decades, and the entomofauna represents one of the richest sources of mecopteran fossil species worldwide. At present, 11 families (excluding incertae sedis), 37 genera, and 73 species of Mecoptera have been reported from the Daohugou Biota (*e.g*., Lian *et al*., 2021a; Cao *et al*., 2022; Yu *et al*., 2025). Mecopterans of the Daohugou biota account for approximately 9% of the *ca*. 800 described insect species. However, previous studies have tended to focus on relatively well-preserved and easily interpretable material, whereas a large number of specimens still await detailed study. The large existing collections provide favourable conditions for future quantitative analyses.

Although Cretaceous mecopteran fossil localities are relatively numerous, the records are scattered and generally yield few specimens. Overall, the fossil record is greatly reduced compared with that of the Jurassic.

Research on fossil Mecoptera in China began relatively late, but remarkable progress has been achieved over the past half century. Nevertheless, the fossil record of Mecoptera in China remains uneven across different geological periods, and studies of Permian and Cenozoic mecopterans in particular are still insufficient and require further investigation.

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APPENDIX 1. Checklist of fossil Mecoptera from China.

Family	Species	Locality	Formation	Age	References
Bittacidae	*Antiquanabittacus punctatus* Yu, Ren, Lin & Yang, 2025	Inner Mongolia	Haifanggou	J_2	Yu *et al*., 2025
	Jichoristella rara Ren, Lu, Ji & Guo, 1995	Beijing	Lushangfen	K_1	Ren *et al*., 1995
	Composibittacus bipunctatus Liu, Shih, Bashkuev & Ren, 2016	Inner Mongolia	Haifanggou	J_2	Liu *et al*., 2016
	Composibittacus reticulatus Liu, Shih, Bashkuev & Ren, 2016	Inner Mongolia	Haifanggou	J_2	Li & Ren, 2009
	Composibittacus retroflexus Yu, Ren, Lin & Yang, 2025	Inner Mongolia	Haifanggou	J_2	Yu et al., 2025
	Decoribittacus euneurus Li & Ren, 2009	Inner Mongolia	Haifanggou	J_2	Li & Ren, 2009
	Decoribittacus stictus Li & Ren, 2009	Inner Mongolia	Haifanggou	J_2	Yang *et al*., 2012a
	Exilibittacus lii Yang, Ren & Shih, 2012	Inner Mongolia	Haifanggou	J_2	Liu *et al*., 2014
	Exilibittacus foliaceus Liu, Shih & Ren, 2014	Inner Mongolia	Haifanggou	J_2	Liu *et al*., 2014
	Exilibittacus plagioneurus Liu, Shih & Ren, 2014	Inner Mongolia	Haifanggou	J_2	Liu *et al*., 2014
	Formosibittacus macularis Li, Ren & Shih, 2008	Inner Mongolia	Haifanggou	J_2	Li *et al*., 2008
	Formosibittacus multifarius Yu, Ren, Lin & Yang, 2025	Inner Mongolia	Haifanggou	J_2	Yu *et al*., 2025
	Jurahylobittacus astictus Li, Ren & Shih, 2008	Inner Mongolia	Haifanggou	J_2	Li *et al*., 2008
	Karattacus longialatus Li & Ren, 2009	Inner Mongolia	Haifanggou	J_2	Li & Ren, 2009
	Liaobittacus longantennatus Ren, 1993	Liaoning	Haifanggou	J_2	Ren, 1993
	Megabittacus beipiaoensis Ren, 1997	Liaoning	Yixian	K_1	Ren, 1997
	Megabittacus colosseus Ren, 1997	Liaoning	Yixian	K_1	Ren, 1997
	Megabittacus spatiosus Yang, Ren & Shih, 2012	Liaoning	Yixian	K_1	Yang *et al*., 2012a
	Mongolbittacus daohugouensis Petrulevičius, Huang & Ren, 2007	Inner Mongolia	Haifanggou	J_2	Petrulevičius *et al*., 2007
	Mongolbittacus oligophlebius Liu, Shih & Ren, 2014	Inner Mongolia	Haifanggou	J_2	Liu *et al*., 2014
	Mongolbittacus speciosus Liu, Shih & Ren, 2014	Inner Mongolia	Haifanggou	J_2	Liu *et al*., 2014
	Orthobittacus maculosus Liu, Shih, Bashkuev & Ren, 2016	Inner Mongolia	Haifanggou	J_2	Liu *et al*., 2016
	Orthobittacus suni Kopeć, Krzemiński, Soszyńska-Maj, Cao & Ren, 2016	Inner Mongolia	Haifanggou	J_2	Kopeć *et al*., 2017
	Preanabittacus validus Yang, Shih & Ren, 2012	Inner Mongolia	Haifanggou	J_2	Yang *et al*., 2012b
Choristopsychidae	*Choristopsyche tenuinervis* Martynov, 1937	Inner Mongolia	Haifanggou	J_2	Qiao *et al*., 2013
	Choristopsyche asticta Qiao, Shih, Petrulevičius & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Qiao *et al*., 2013
	Choristopsyche perfecta Qiao, Shih, Petrulevičius & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Qiao *et al*., 2013
	Paristopsyche angelineae Qiao, Shih, Petrulevičius & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Qiao *et al*., 2013
Cimbrophlebiidae	*Telobittacus fragosus* Zhang, 1993	Shaanxi	Fengjiashan	K_1	Zhang, 1993
	Telobittacus bellus Yang, Shih & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Yang *et al*., 2013
	Telobittacus decorus Zhang, Shih, Zhao & Ren, 2015	Inner Mongolia	Haifanggou	J_2	Zhang *et al*., 2015
	Bellicimbrophlebia angusta Yang, Shih & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Yang *et al*., 2013
	Bellicimbrophlebia cruciata Yang, Shih & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Yang *et al*., 2013
	Bellicimbrophlebia disvena Yang, Shih & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Yang *et al*., 2013
	Bellicimbrophlebia eumorpha Yang, Shih & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Yang *et al*., 2013
	Bellicimbrophlebia heteroneura Zhang, Shih, Zhao & Ren, 2015	Inner Mongolia	Haifanggou	J_2	Zhang *et al*., 2015
	Cimbrophlebia amoena Zhang, Shih, Zhao & Ren, 2015	Inner Mongolia	Haifanggou	J_2	Zhang *et al*., 2015
	Cimbrophlebia gracilenta Zhang, Shih, Zhao & Ren, 2015	Inner Mongolia	Haifanggou	J_2	Zhang *et al*., 2015
	Cimbrophlebia rara Wang, Shih & Ren, 2014	Liaoning	Yixian	K_1	Wang *et al*., 2014
	Juracimbrophlebia ginkgofolia Wang, Labandeira, Shih & Ren, 2012	Inner Mongolia	Haifanggou	J_2	Wang *et al*., 2012
	Mirorcimbrophlebia daohugouensis Yang, Shih & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Yang *et al*., 2013
	Perfecticimbrophlebia laetus Yang, Shih & Ren, 2012	Inner Mongolia	Haifanggou	J_2	Yang *et al*., 2012b

Eomeropidae	*Jurathauma simplex* Zhang, Shih, Petrulevičius & Ren, 2011	Inner Mongolia	Haifanggou	J_2	Zhang *et al*., 2011
	Jurathauma xinjiangensis Wang, Yao, Wang, Li & Yang, 2023	Xinjiang	Badaowan	J_1	Wang *et al*., 2023
	Tsuchingothauma shihi Ren & Shih, 2005	Inner Mongolia	Haifanggou	J_2	Ren & Shih, 2005
	Tsuchingothauma gongi Zhao, Zhao, Chen, Zhang & Wang, 2019	Inner Mongolia	Haifanggou	J_2	Zhao *et al*., 2019
	Typhothaumae excelsa Zhang, Shih & Ren, 2012	Liaoning	Yixian	K_1	Zhang *et al*., 2012
	Typhothauma yixianensis Ren & Shih, 2005	Liaoning	Yixian	K_1	Ren & Shih, 2005
Holcorpidae	*Conicholcorpa stigmosa* Li, Shih, Wang & Ren, 2017	Inner Mongolia	Haifanggou	J_2	Li *et al*., 2017
	Conicholcorpa longa Zhang, Shih & Ren, 2021	Inner Mongolia	Haifanggou	J_2	Zhao *et al*., 2021
Aneuretopsychidae	*Jeholopsyche bella* Qiao, Shih & Ren, 2012	Liaoning	Yixian	K_1	Qiao *et al*., 2012a
	Jeholopsyche completa Qiao, Shih & Ren, 2012	Liaoning	Yixian	K_1	Qiao *et al*., 2012a
	Jeholopsyche liaoningensis Ren, Shih & Labandeira, 2011	Liaoning	Yixian	K_1	Ren *et al*., 2011
	Jeholopsyche maxima Qiao, Shih & Ren, 2012	Liaoning	Yixian	K_1	Qiao *et al*., 2012a
Mesopsychidae	*Epicharmesopsyche pentavenulosa* Shih, Qiao, Labandeira & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Shih *et al*., 2013
	Lichnomesopsyche daohugouensis Ren, Labandeira & Shih, 2010	Inner Mongolia	Haifanggou	J_2	Ren *et al*., 2010a
	Lichnomesopsyche gloriae Ren, Labandeira & Shih, 2010	Inner Mongolia	Haifanggou	J_2	Ren *et al*., 2010a
	Lichnomesopsyche prochorista Lin, Shih, Labandeira & Ren, 2016	Inner Mongolia	Haifanggou	J_2	Lin *et al*., 2016
	Vitimopsyche pristina Lin, Shih, Labandeira & Ren, 2016	Inner Mongolia	Haifanggou	J_2	Lin *et al*., 2016
	Vitimopsyche kozlovi Ren, Labandeira & Shih, 2010	Liaoning	Yixian	K_1	Ren *et al*., 2010a
	Vitimopsyche pectinella Gao, Shih, Labandeira, Santiago-Blay, Yao & Ren, 2016	Liaoning	Yixian	K_1	Gao *et al*., 2016
	Vitimopsyche picta Xu, Bashkuev, Lian & Zhao, 2025	Henan	Yangshuzhuang	J_2	Xu *et al*., 2025
	Turbidapsyche jinsuoguanensis (Lian, Cai & Huang, 2021)	Shaanxi	Yanchang	T_2	Lian *et al*., 2021
	Turbidapsyche liaoi (Lian, Cai & Huang, 2021)	Xinjiang	Huangshanjie	T_3	Lian *et al*., 2021
	Turbidapsyche tongchuanensis (Hong, 2007)	Shaanxi	Yanchang	T_2	Hong, 2007; Lian *et al*., 2024a
	Turbidapsyche orientalis Lian & Huang, 2024	Shaanxi	Yanchang	T_2	Lian *et al*., 2024a
	Turbidapsyche sparsanota Lian & Huang, 2024	Shaanxi	Yanchang	T_2	Lian *et al*., 2024a
	Turbidapsyche hongi Lian & Huang, 2024	Shaanxi	Yanchang	T_2	Lian *et al*., 2024a
	Mesopanorpodes shaanxiensis Hong, Guo & Wang, 2002	Shaanxi	Yanchang	T_2	Hong *et al*., 2002
	Mesopanorpodes latus Sun & Hong, 2011	Shaanxi	Yanchang	T_2	Sun & Hong, 2011
	Prochoristella shuangyangensis Lian, Cai & Huang, 2020	Jilin	Xiaofengmidingzi	J_1 ?	Lian *et al*., 2020

	Itaphlebia jeniseica Novokshonov, 1997	Inner Mongolia	Haifanggou	J_2	Sun *et al*., 2007a; Cao *et al*., 2016
	Itaphlebia multa Novokshonov, 1997	Inner Mongolia	Haifanggou	J_2	Sun *et al*., 2007b; Cao *et al*., 2016
	Itaphlebia decorosus (Sun, Ren & Shih, 2007)	Inner Mongolia	Haifanggou	J_2	Sun *et al*., 2007a; Cao *et al*., 2016
	Itaphlebia ruderalis (Ren, 1995)	Inner Mongolia	Haifanggou	J_2	Sun *et al*., 2007a, b; Cao *et al*., 2016
Nannochoristidae		Liaoning	Haifanggou	J_2	Ren *et al*., 1995
	Itaphlebia exquisita Liu, Zhao & Ren, 2010	Inner Mongolia	Haifanggou	J_2	Liu *et al*., 2010
	Itaphlebia laeta Liu, Zhao & Ren, 2010	Inner Mongolia	Haifanggou	J_2	Liu *et al*., 2010
	Itaphlebia amoena Cao, Shih, Bashkuev & Ren, 2016	Inner Mongolia	Haifanggou	J_2	Cao *et al*., 2016
	Itaphlebia longiovata Cao, Shih, Bashkuev & Ren, 2016	Inner Mongolia	Haifanggou	J_2	Cao *et al*., 2016
	Itaphlebia procera Cao, Shih & Ren, 2022	Inner Mongolia	Haifanggou	J_2	Cao *et al*., 2022
	Itaphlebia elegana Cao, Shih & Ren, 2022	Inner Mongolia	Haifanggou	J_2	Cao *et al*., 2022
	Itaphlebia yulinensis Xu, Bashkuev, Lian & Zhao, 2025	Henan	Yangshu-zhuang	J_2	Xu *et al*., 2025
	Orthophlebia yaojiashanensis (Lin, 1980)	Zhejiang	Laocun	K_1	Lin, 1980
	Orthophlebia fanshanensis Ren, 1995	Beijing	Lushangfen	K_1	Ren, 1995
	Orthophlebia quadrimmacula Lin, 1982	Shaanxi	Zhiluo	J_{2-3}	Lin, 1982, Lian, 2024
	Orthophlebia yangjuanxiangensis Hong, 1985	Hebei	Xiahuayuan	J_{1-2}	Hong, 1985
	Orthophlebia latebrosa Sukatsheva, 1985	Xinjiang	Badaowan	J_1	Zhang, 1996
	Orthophlebia deformis (Lin, 1986)	Guangxi	Shiti	J_2	Lin, 1986
	Orthophlebia rotundipennis Martynov, 1937	Anhui	Hanshan	J_2	Lin, 1985
	Orthophlebia exculpta Zhang, 1996	Xinjiang	Xiaoquangou Group	T_3	Zhang, 1996
	Orthophlebia colorata Zhang, 1996	Xinjiang	Badaowan	J_1	Zhang, 1996
	Orthophlebia liaoningensis Ren, 1997	Liaoning	Yixian	K_1	Ren *et al*., 1997
	Orthophlebia yaogouensis (Hong, 1983)	Hebei	Jiulongshan	J_2	Hong, 1983
Orthophlebiidae	*Orthophlebia luanpingensis* (Hong, 1983)	Hebei	Jiulongshan	J_2	Hong, 1983
	Orthophlebia densa (Zhang, 1996)	Xinjiang	Badaowan	J_1	Zhang, 1996
	Orthophlebia monstrosa (Zhang, 1996)	Xinjiang	Badaowan	J_1	Zhang, 1996
	Orthophlebia kuliki (Martynova, 1948)	Xinjiang	Badaowan	J_1	Zhang, 1996
	Orthophlebia brodiei Tillyard, 1933	Xinjiang	Badaowan	J_1	Zhang, 1996
	Orthophlebia extensa Martynov, 1937	Inner Mongolia	Haifanggou	J_2	Zhang *et al*., 2022
	Orthophlebia elenae Willmann & Novokshonov, 1998	Inner Mongolia	Haifanggou	J_2	Zhang *et al*., 2022
	Orthophlebia nervulosa Qiao, Shih & Ren, 2012	Inner Mongolia	Haifanggou	J_2	Qiao *et al*., 2012b
	Orthophlebia chinensis Soszyńska-Maj, Kopeć & Ren, 2020	Inner Mongolia	Haifanggou	J_2	Soszyńska-Maj *et al*., 2020
	Orthophlebia xiangyu Lian, 2025	Shaanxi	Yanchang	T_2	Lian, 2025b
	Orthophlebia lini Lian & Huang, 2024	Shaanxi	Yanan	J_2	Lian *et al*., 2024b
	Orthophlebia picta Lian, 2024	Henan	Yangshuzhuang	J_2	Lian, 2024

	Jiyuanphlebia incompleta Lian & Huang, 2024	Henan	Yangshuzhuang	J_2	Lian, 2024
	Quadrivena jiyuanensis Lian, 2024	Henan	Yangshuzhuang	J_2	Lian, 2024
	Gigaphlebia riccardii (Petrulevičius & Ren, 2012)	Inner Mongolia	Haifanggou	J_2	Soszyńska-Maj *et al*., 2018
	Juraphlebia eugeniae Soszyńska-Maj & Krzemiński, 2020	Inner Mongolia	Haifanggou	J_2	Soszyńska-Maj *et al*., 2020
	Longiphlebia stigmosa (Qiao, Shih & Ren, 2012)	Inner Mongolia	Haifanggou	J_2	Qiao *et al*., 2012b; Soszyńska-Maj *et al*., 2018
	Longiphlebia incompleta Lian, Cai & Huang, 2021	Hebei	Tiaojishan	J_3	Lian *et al*., 2021b
	Sinorthophlebia weichangensis Lian, 2025	Hebei	Dabeigou	K_1	Lian, 2025a
	Jibeiorthophlebia xiaofanzhangziensis Hong, 1983	Hebei	Jiulongshan	J_2	Hong, 1983
	Jibeiorthophlebia internata Hong, 1983	Hebei	Jiulongshan	J_2	Hong, 1983
Panorpidae ?	*Jurassipanorpa impunctata* Ding, Shih & Ren, 2014	Inner Mongolia	Haifanggou	J_2	Ding *et al*., 2014
	Jurassipanorpa sticta Ding, Shih & Ren, 2014	Inner Mongolia	Haifanggou	J_2	Ding *et al*., 2014
Protorthophlebiidae	*Protorthophlebia punctata* Soszyńska-Maj, Krzemiński & Kopeć, 2020	Inner Mongolia	Haifanggou	J_2	Soszyńska-Maj *et al*., 2020
	Protorthophlebia strigata Zhang, 1996	Xinjiang	Xiaoquangou Group	T_3	Zhang, 1996
	Protorthophlebia macula Lin, 1992	Xinjiang	Huangshanjie	T_3	Lin, 1992
	Protorthophlebia enormis (Lin, 1986)	Guangxi	Shiti	J_2	Lin, 1986
	Protorthophlebia ladinica Hong, Chen & Liu, 2002	Shaanxi	Yanchang	T_2	Hong *et al*., 2002a; Lian, 2025b
	Protorthophlebia triassica Hong, Chen & Liu, 2002	Shaanxi	Yanchang	T_2	Hong *et al*., 2002a; Lian, 2025b
	Protorthophlebia yanqingensis Hong, 1997	Beijing	Tuchengzi	J_3-K_1	Hong, 1997
	Protorthophlebia latipennis Tillyard, 1933	Guangxi	Shiti	J_2	Lin, 1986;
		Jiangxi	Menkoushan	J_1	Huang *et al*., 1991
		Xinjiang	Badaowan	J_1	Zhang, 1996
	Protorthophlebia obscura (Martynov, 1925)	Xinjiang	Badaowan	J_1	Zhang, 1996
	Protorthophlebia yaogouensis Hong, 1983	Hebei	Jiulongshan	J_2	Hong, 1983
	Protorthophlebia gracilis Lian, 2024	Henan	Yangshuzhuang	J_2	Lian, 2024
	Protorthophlebia prajna Lian, 2025	Shaanxi	Yanchang	T_2	Lian, 2025b
Pseudopolycentropodidae	*Pseudopolycentropus daohugouensis* Zhang, 2005	Inner Mongolia	Haifanggou	J_2	Grimaldi *et al*., 2005
	Pseudopolycentropus janeannae Ren, Shih & Labandeira, 2010	Inner Mongolia	Haifanggou	J_2	Ren *et al*., 2010b
	Pseudopolycentropus novokshonovi Ren, Shih & Labandeira, 2010	Inner Mongolia	Haifanggou	J_2	Ren *et al*., 2010b
	Sinopolycentropus rasnitsyni Shih, Yang, Labandeira & Ren, 2011	Inner Mongolia	Haifanggou	J_2	Shih *et al*., 2011

Sinoagetopanorpidae	*Sinoagetopanorpa permiana* Lin, Nel & Huang, 2010	Anhui	Yinping	P_2	Lin *et al*., 2010; Lian *et al*., 2023c
	Sinoagetopanorpa nigra Lian, Cai & Huang, 2023	Anhui	Yinping	P_2	Lian *et al*., 2023c
	Sinoagetopanorpa rotunda Lian, Cai & Huang, 2023	Anhui	Yinping	P_2	Lian *et al*., 2023c
	Sinoagetopanorpa lini Lian, Cai & Huang, 2023	Anhui	Yinping	P_2	Lian *et al*., 2023c
	Sinoagetopanorpa minuta Lian, Cai & Huang, 2023	Anhui	Yinping	P_2	Lian *et al*., 2023c
	Sinoagetopanorpa elegans Lian, Cai & Huang, 2023	Anhui	Yinping	P_2	Lian *et al*., 2023c
	Sinoagetopanorpa grimaldii Lian, Cai & Huang, 2023	Anhui	Yinping	P_2	Lian *et al*., 2023c
	Sinoagetopanorpa magna Lian, Cai & Huang, 2023	Anhui	Yinping	P_2	Lian *et al*., 2023c
	Raragetopanorpa zhangi Lian, Cai & Huang, 2023	Anhui	Yinping	P_2	Lian *et al*., 2023c
	Permoagetopanorpa yinpingensis Lian, Cai & Huang, 2023	Anhui	Yinping	P_2	Lian *et al*., 2023c
	Permoagetopanorpa incompleta Lian, Cai & Huang, 2023	Anhui	Yinping	P_2	Lian *et al*., 2023c
Parachoristidae	*Triasoparachorista huaxiaensis* (Hong, 2009)	Shaanxi	Yanchang	T_2	Hong, 2009a
	Sinoparachorista rara Lian, Cai & Huang, 2023	Shaanxi	Yanchang	T_2	Lian *et al*., 2023a
	Sinoparachorista magna Lian, 2025	Shaanxi	Yanchang	T_2	Lian, 2025b
	Virgulaparachorista elegans Lian, Cai & Huang, 2023	Shaanxi	Yanchang	T_2	Lian *et al*., 2023a
	Virgulaparachorista tongchuanensis Lian, Cai & Huang, 2023	Shaanxi	Yanchang	T_2	Lian *et al*., 2023a
	Parachorista pulchra Lian, 2025	Shaanxi	Yanchang	T_2	Lian, 2025b
	Parachorista libaii Lian, 2025	Shaanxi	Yanchang	T_2	Lian, 2025b
	Parachorista ruga Lian, 2025	Shaanxi	Yanchang	T_2	Lian, 2025b
	Parachorista triassica Lian, 2025	Shaanxi	Yanchang	T_2	Lian, 2025b
	Parachorista elegantula Lian, 2025	Shaanxi	Yanchang	T_2	Lian, 2025b
	Parachorista hongi Lian, 2025	Shaanxi	Yanchang	T_2	Lian, 2025b
Thaumatomeropidae	*Thaumatomerope sinensis* Lian & Huang, 2023	Shaanxi	Yanchang	T_2	Lian *et al*., 2023b
Permochoristidae	*Permeca chaohuensis* Lian, Cai & Huang, 2022	Anhui	Yinping	P_2	Lian *et al*., 2022a
	Mesochorista tillyardi Lian & Huang, 2025	Anhui	Yinping	P_2	Lian *et al*., 2025
	Mesochorista yinpingensis Lian & Huang, 2025	Anhui	Yinping	P_2	Lian *et al*., 2025
	Mesochorista tongchuanensis Lian, Cai & Huang, 2022	Shaanxi	Yanchang	T_2	Lian *et al*., 2022c
	Mesochorista conjunctiva (Guo & Hong, 2003)	Shaanxi	Yanchang	T_2	Guo & Hong, 2003; Lian *et al*., 2022c
	Agetopanorpa sinica Lian, Cai & Huang, 2022	Shaanxi	Yanchang	T_2	Lian *et al*., 2022b
	Chaohuchorista liaoi Lian, Cai & Huang, 2022	Anhui	Yinping	P_2	Lian *et al*., 2022b
Family incertae sedis	*Fortiholcorpa paradoxa* Wang, Shih & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Wang *et al*., 2013
	Miriholcorpa forcipata Wang, Shih & Ren, 2013	Inner Mongolia	Haifanggou	J_2	Wang *et al*., 2013
	Kalochorista isofurca Lin, 1992	Xinjiang	Huangshanjie	T_3	Lin, 1992
	Yanorthophlebia hebeiensis Ren, 1995	Hebei	Yixian	K_1	Ren, 1995
	Neorthophlebia yunnanensis Zhang & Hong, 2003	Yunnan	Tuodian	J_3	Zhang *et al*., 2003
	Neorthophlebopsis qishuiheensis Hong, 2005	Shaanxi	Yanchang	T_2	Hong *et al*., 2005
	Xinjiangia tashidianensis Hong, 1983	Xinjiang	Kezilenur	J_2	Hong, 1983
	Sogdochyche zhouyingziensis Hong, 1983	Hebei	Jiulongshan	J_2	Hong, 1983

Footnote: This list does not include Siphonaptera. Some authors have suggested that *Jurassipanorpa* does not belong to Panorpidae (Soszyńska-Maj *et al*., 2020); however, this assignment remains subject to further debate.