

Letter to the editor

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Europe vs. China: *Pholcus* (Araneae, Pholcidae) from Yanshan-Taihang Mountains confirms uneven distribution of spiders in Eurasia

DEAR EDITOR,

Morphological and molecular data were used to study 35 species of the *Pholcus phungiformes* species group from the Yanshan-Taihang Mountains in China. The uneven distribution pattern of spiders in Eurasia is discussed, with a focus on Europe and China.

Europe covers approximately 10.18 million km² in western Eurasia, while China covers about 9.6 million km² in the east. Due to their relative positions to each other and similar land areas, spider species richness in Europe and China is comparable (Li, 2020). Indeed, Europe contains a total of 5 441 species in 727 genera from 63 spider families (Nentwig et al., 2022), and China contains a total of 5 452 species in 827 genera from 69 families (Biodiversity Committee of the Chinese Academy of Sciences, 2020), with about 80% of families in common.

Although research on European spiders has a long and comprehensive history, research on Chinese spiders is still in the initial stage. The first checklist of spiders in China reported 521 species in 149 genera from 34 families (Wang & Zhu, 1963), while the second checklist included 1 050 species in 46 families (Zhu, 1983). Song et al. (1999), who published the first English book on Chinese spiders, reported 2 361 species in 450 genera from 56 families, while Li (2020) reported 5 084 species in 809 genera from 69 spider families. Thus, we predict that the number of spider species in China will increase significantly in the coming years, and that the number of spider species in China is much higher than that in Europe (Li et al., 2021; Yao et al., 2021). Our above hypothesis is based on the uneven distribution patterns of spiders in Eurasia. Due to the Great European Plain, Europe has the lowest average elevation of any continent overall. During the

Pleistocene, 80% of glacial ice lay in the Northern Hemisphere, covering most of northern Europe, leading to mass species extinctions (Cox et al., 2019). In contrast, China's mountainous landscape provided refuge for organisms, enabling species such as spiders to survive glacial periods, but acting as a barrier to species dispersal after glaciation (Figure 1).

Our current study on the *Pholcus phungiformes* species group from the Yanshan-Taihang Mountains in China provides further evidence that spiders are potentially more species rich in China than in Europe. *Pholcus Walckenaer*, 1805 of the family Pholcidae C.L. Koch, 1850 contains 362 species, most of which are from the Northern Hemisphere, including 15 from Europe (Nentwig et al., 2022) and 134 from China (Li, 2020). Moreover, in a single 16-day expedition in the Yanshan-Taihang Mountains, we discovered 13 species new to science. Thus, a large amount of spider diversity in China is yet to be discovered, consistent with recent studies on other spider taxa in China (Li et al., 2021; Liu et al., 2022; Yao et al., 2021). For detailed morphological descriptions, diagnoses, and illustrations of the new species, please see the Supplementary Materials.

NOMENCLATURAL ACTS REGISTRATION

The specimens studied were deposited in the College of Life Science, Shenyang Normal University (SYNU) in Liaoning, China, Institute of Zoology, Chinese Academy of Sciences (IZCAS) in Beijing, China, and Museum of Hebei University (MHBHU) in Hebei, China. The electronic version of this article in portable document format represents a published work according to the International Commission on Zoological Nomenclature (ICZN), and hence the new names contained in

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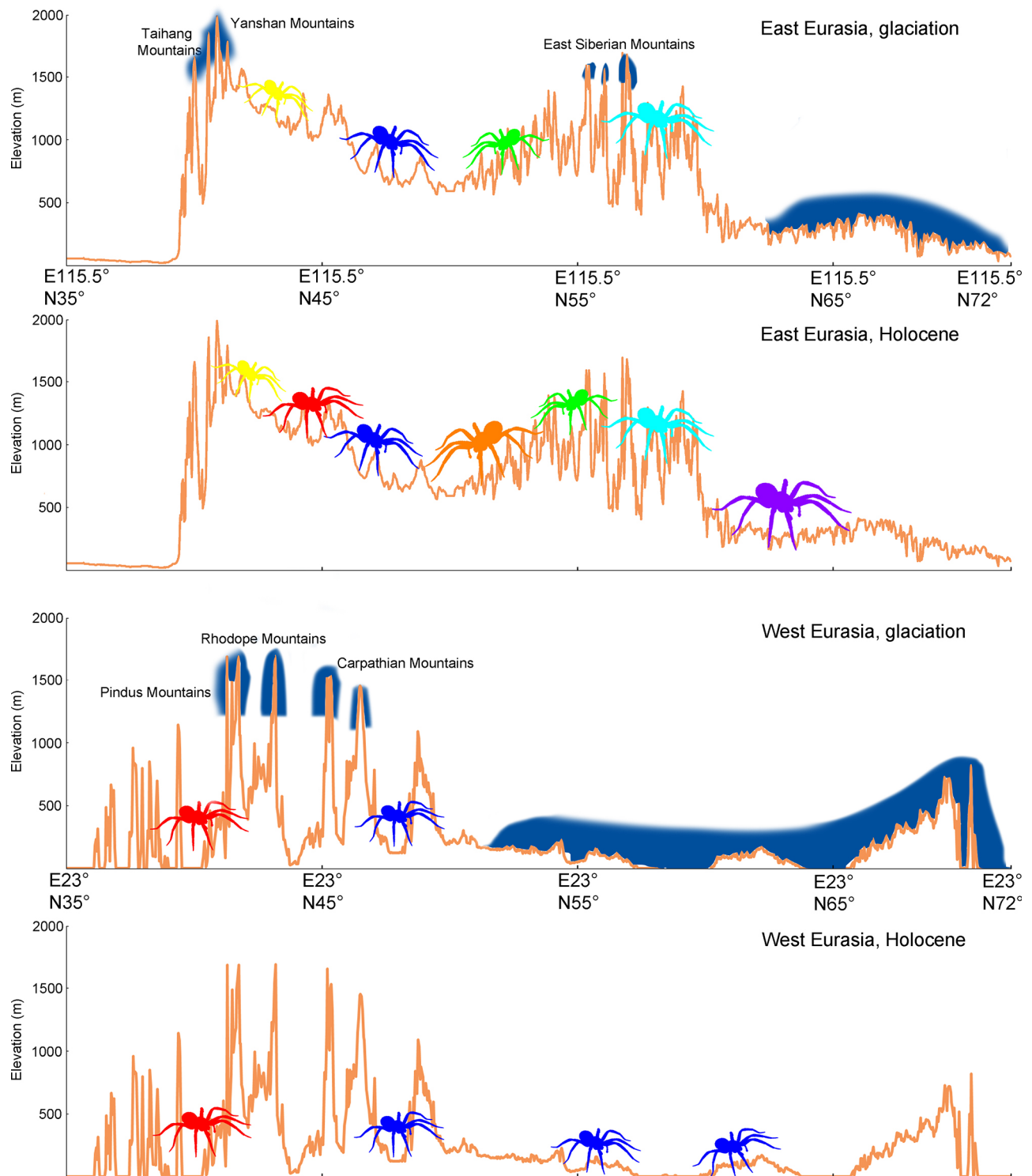


Figure 1 Simplified graphical comparison of spiders in western and eastern Eurasia during glaciation and the Holocene
 Dark orange lines indicate true elevation. Dark blue zone indicates glaciers and continental ice sheets.

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Publication

LSID: urn:lsid:zoobank.org:pub: 102CC3B4-2E9B-420C-A83F-9491662B690E

Pholcus changchi Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: 0A26DCC5-FD77-4202-A1E4-093D62720A41

Pholcus chengde Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: 7393BD56-52EB-4086-B376-47C264574BEF

Pholcus datong Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: EA15CDDA-E772-46F4-AE86-22534512DE1F

Pholcus fengning Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: 2D1B10F4-7584-4222-ABBA-BC87091D0CF7

Pholcus guangling Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: 1663418B-05F5-4A3E-8D9D-1DD6167A5D09

Pholcus huailai Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: 6AD43FA6-A3E9-4AA3-A9D2-39BA8647D222

Pholcus hunyuan Yao, Li & Lu, **sp. nov.**

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Pholcus kuaile Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: 1D51DCCD-3C05-48BA-BDDD-882BCDA02583

Pholcus luanping Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: 1EC5BD9B-35F4-4B12-AF75-3CFF54109DD0

Pholcus tang Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: A6A8D338-F9B2-444E-9889-B8B62EB13F3A

Pholcus xinglong Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: 7520BF42-F9A9-460F-B637-6A03533BDEBC

Pholcus xinzhou Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: F216430D-81FA-465D-9BCA-A0830C0BA895

Pholcus yanqing Yao, Li & Lu, **sp. nov.**

LSID: urn:lsid:zoobank.org:act: 87FD0446-CAB8-4907-AF4D-B31B0342152C

SCIENTIFIC FIELD SURVEY PERMISSION INFORMATION

Permission for field surveys in Hebei was granted by the Hebei Provincial Department of Forestry, Shijiazhuang, China.

SUPPLEMENTARY DATA

Supplementary data to this article can be found online.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

Z.Y.Y. and S.Q.L. designed the study. Z.Y.Y. and Y.L. contributed to fieldwork. Z.Y.Y. performed morphological species identification and collected and analyzed molecular

data. Y.L. and C.C. finished the species descriptions and took the photos. X.Q.Z. illustrated the figures in the main text. Z.Y.Y., S.Q.L., and Y.L. drafted and revised the manuscript. All authors read and approved the final version of the manuscript.

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