

# Regression of East Tethys resulted in a center of biodiversity: A study of Mysmenidae spiders from the Gaoligong Mountains, China

## DEAR EDITOR,

This research involved the study of 31 species from the spider family Mysmenidae Petrunkevitch, 1928, found in the Gaoligong Mountains of China, including one new genus and 13 new species. Our results suggested that regression of East Tethys contributed to the appearance of a center of biodiversity.

The Tethys, a classical and hot topic in geology. It has undergone a succession of significant geodynamic transformations, transitioning from an ancient ocean to the current Alpine-Himalayan orogenic belt. Notably, the East Tethys, serving as an invaluable lens through which to study continental geology and geodynamics, has played a pivotal role in triggering the major geological reconstructions of the entire Tethys (Pan et al., 1997).

During the Mesozoic, the East Tethys region primarily existed as an oceanic expanse (Figure 1A). However, in the Cenozoic, crustal shortening resulted in the formation of the Alpine-Himalayan orogenic belt along the southern margin of the Eurasian plate (Figure 1B) (Rosenbaum & Lister, 2002), causing East Tethys regression (Figure 1C). Subsequent sediment deposition occurred on the former Tethys seabed, which gradually rose and formed a mountainous landscape. Biotic colonization, *in situ* diversification, and local recruitment in the East Tethys — a vast, expansive, and empty biotope — facilitated its emergence as an area of high species diversification. For instance, the rapid expansion of *Pireneitega* spiders in Eurasia benefited from the regression of the East Tethys during the early Oligocene, driven by uplift of the Alps-Himalayas during the Miocene (Zhao et al., 2020, 2022).

The Gaoligong Mountains, situated in Yunnan and part of the former East Tethys region, are one of the world's most significant center of biodiversity outside of the tropics (Chaplin, 2005). Referred to as the "world gene bank" and "sanctuary of life", this region harbors approximately 17% of higher plant species, 30% of mammal species, and 35% of bird species found in China. Here, we studied the spider family Mysmenidae Petrunkevitch, 1928, from the Gaoligong Mountains, providing further evidence that East Tethys regression played a substantial role in fostering a remarkable diversity of spiders. Based on morphological and DNA

barcode data, we conducted a comprehensive examination of 31 species in nine genera, resulting in the identification of 13 proposed new species. For detailed morphological descriptions, diagnoses, and illustrations of the new species, please refer to the Supplementary Materials.

## NOMENCLATURAL ACTS REGISTRATION

Apart from the type specimens of previously described species housed at the College of Life Sciences, Hunan Normal University, Changsha, China (HNU) and Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS), all other examined morphological and sequenced molecular materials have been deposited in the Natural History Museum of Sichuan University, Chengdu, China (NHMSU). 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 the electronic version are effectively published under the Code from the electronic edition alone (see Articles 8.5–8.6 of the Code). This published work and the nomenclatural acts it contains have been registered in ZooBank, the online registration system for the ICZN. The ZooBank LSIDs (Life Science Identifiers) can be resolved, and the associated information can be viewed through any standard web browser by appending the LSID to the prefix <http://zoobank.org/>.

Publication LSID: urn:lsid:zoobank.org:pub: D3DB8CBD-4917-4F44-8150-80FAE664BF52

*Drungena* Lin & S. Li, **gen. n.**

LSID: urn:lsid:zoobank.org:act: 8E5E6D0E-BA87-46DF-9A51-6844FB4B63A5

*Drungena crewsae* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: 85CB9323-CB6A-453B-9CB1-608F2FEB4A89

*Gaoligonga longjiang* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: E841E158-3AFF-4EF1-883B-F0F51F368662

*Gaoligonga luzhang* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: 553AF657-1BCF-4169-841D-4EAE880B8ECD

*Mengmena mangkuan* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: 77F5802D-5CE4-4848-8EC3-DEBE5D4C8A71

*Mengmena lushui* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: D9D7826F-9CBA-44A5-809D-308B38F882CB

*Mosul aludi* Q. Zhang, S. Li & Lin, **sp. n.**

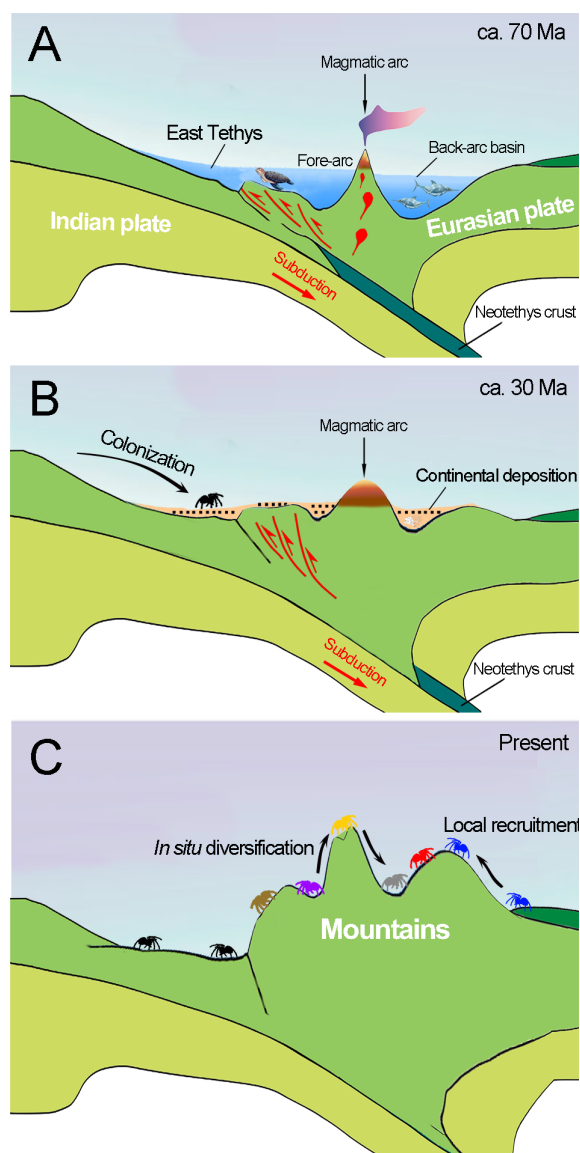
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**Figure 1** Sea-land transition in East Tethys contributed to the emergence of a center of biodiversity

A: East Tethys as an ocean. B: Regression of East Tethys and colonization of biota. C: *In situ* diversification of biota and local recruitment in newly formed mountainous landscape

*Mosuo banpo* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: 1B1CAB19-2AF4-4718-862D-A3E3CE255C72

*Mysmena buccera* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: DAE441ED-6F75-4E91-AABE-98E314E9144A

*Mysmena dulong* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: 9442C0F7-F1EB-474D-B933-18B1F79979C9

*Mysmena jimudeng* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: B5C817A9-A34B-4062-B549-93D259DBC605

*Mysmena qinlangdang* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: AABC663C-6B30-4D1C-A257-E0D8820929E0

*Phricotelus langwanduo* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: FF254842-EC4D-476D-B217-185E0C6A71CC

*Simaoa sijitong* Q. Zhang, S. Li & Lin, **sp. n.**

LSID: urn:lsid:zoobank.org:act: 15744894-A0AD-490C-ACFC-0C80022C527C

## SCIENTIFIC FIELD SURVEY PERMISSION INFORMATION

Permission for field surveys in Lushui, Fugong, and Gongshan counties was granted by the Administration Bureau of Gaoligong Mountains National Nature Reserve, Yunnan, 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

Y.C.L. and S.Q.L. designed the study. Q.Q.Z. and Y.L. performed morphological species identification and collected and analyzed molecular data. Y.C.L., Q.Q.Z., Y.L., S.Q.L., Z.Y.Y., and X.Q.Z. drafted the manuscript. All authors read and approved the final version of the manuscript.

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