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EVOLUTIONARY DIVERSIFICATION AND HISTORICAL BIOGEOGRAPHY OF NANNENINI JUMPING SPIDERS IN THE SOUTH ASIAN HIGHLANDS

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The northward drift of the Indian subcontinent and its subsequent biotic exchanges with adjacent landmasses have significantly influenced South Asian biodiversity, though they remain active subjects of scientific debate. This study investigates biogeographic patterns and evolutionary relationships within a clade of spiders endemic to South Asia, focusing on two newly identified species from India. Fieldwork was conducted across all climatic regions of Sri Lanka, including wet zone forests (Hiyare, Hiniduma FR, Labugama, Pompakele FR, and Sinharaja FR), montane forests (Hakgala SNR, Horton Plains NP, Piduruthalagala, Loolecondera Estate, Upcot, and Knuckles Range), dry zone forests (Katharagama Peak and Mihintale Sanctuary), and in tropical forests of Southern Western Ghats, Kerala, India. DNA extracted from leg tissue of two newly identified species was sequenced for mitochondrial gene *CO1*, nuclear ribosomal RNA fragments (*18S* and *28S*), and nuclear *H3*. Phylogenetic trees based on the concatenated four gene matrix were constructed using both Maximum Likelihood (ML) and Bayesian inference methods. A time calibrated analysis was performed to estimate diversification timing, and ancestral area reconstruction was conducted to infer the historical geographic distribution of ancestral lineages. Phylogenetic analyses strongly supported the monophyly of the Nannenini clade, with three distinct subclades. Nannenini spiders likely dispersed across South and Southeast Asia between the Late Oligocene and Early Miocene, a period marked by major climatic and tectonic shifts that facilitated their lineage diversification. During the Late Miocene, cooling and increased acidification restricted forest adapted species to montane refugia, especially in Sri Lanka's central highlands and the mountainous regions of India, promoting isolation and driving speciation among montane adapted Nannenini species. Montane environments likely acted as critical climate refugia, maintaining biodiversity during adverse climates and facilitating later expansion, highlighting the crucial role of Sri Lanka's central highlands and India's montane zones in regional biodiversity.

Keywords: Climate change, Divergence dating, Montane refugia, South Asia, Speciation