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Mathew M. Joseph Sunil Jose K DNA barcoding, Molecular phylogeny and Taxonomy of selected genera of cobweb spiders (Araneae: Theridiidae) of Sri Lanka

Tharmarajan. M<sup>1</sup>\* and Benjamin S.P<sup>1</sup>



<sup>1</sup>National Institute of Fundamental Studies, Hanthana Road, Kandy, Sri Lanka, <u>\*mawva9@gmail.com</u>

## Abstract

Patterns of present-day faunal diversity may provide insights into their origin. Historically older islands such as Sri Lanka may have been accumulating species for an extended period. Nevertheless, Sri Lanka contains a rich assemblage of endemic spider lineages. A recent study stated that in Sri Lanka, over 500 species of spiders are known, and they are under 45 families. Endemic spider fauna is limited to South-West and central highlands, and they are mostly related to the Western Ghats of India. Family Theridiidae is one of the seventh largest and diverse families in the Araneae represented by 124 genera with over 2500 species. Cobweb spiders of Sri Lanka are insufficiently explored. So far, only 31 species have been recorded and described. An ongoing survey of spider diversity in Sri Lanka revealed the presence of 4 new species of Rhomphaea, two new species of Neospintharus, four new species of Meotipa and a new species of Argyrodes. Taxonomic revision and multi-locus molecular phylogeny of these new taxa with other Asian and American species were constructed to investigate the evolutionary origin, divergent times, and their biogeographical origins. Sampling was done by beating vegetation and hand collection all around the country, and species distribution was mapped in QGIS v 3.14. Collected specimens were catalogued and preserved in 70% and 100% ethanol. Species were identified with an Olympus SZX7 stereomicroscope using available literature. DNA was extracted from two legs of each specimen using the Qiagen DNeasy Tissue kit. PCR was done with previously successfully tested primers of three genes: 16S, COI and 28S. Before likelihood and Bayesian analysis, Partition finder software v 2.1.1 was run to find the best fit model for each partition. The lengths of targeted fragments: 16S ~536bp, 28S ~544bp and CO1 ~1067bp. Likelihood and Bayesian topologies agree on the fundamental classification of subfamily Argyrodinae and support the monophyly of Rhomphaea and Ariamnes with polyphyletic Neospintharus and Argyrodes. Within the multiple supported clades, each type of lineage shows the geographic distribution of species between North America + South America and South East Asia + East Asia. Dated phylogeny suggests speciation occurred around 19.6 Mya between the late Paleogene and early Neogene. The results showed that most of the Sri Lankan species are closely related with South East Asian countries than American species and appear to be evolved very recently less than 2Mya. Five species of Argyrodes, two species of Coleosoma, one species of Cephalobares, three species of Meotipa, and one species of Chikunia were redescribed and recorded after a century. This study represents a milestone towards the understanding of biodiversity and conservation of Sri Lankan cobweb spiders.

Keywords: Sri Lanka, Taxonomy, Theridiidae, Phylogeny.