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A fossil of the austral tree fern genus *Lophosoria* (Dicksoniaceae) from mid-Cretaceous Myanmar amber

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INTRODUCTION & AIM

Fossil records are indispensable to inferences of the phylogeny and evolutionary history of fern lineages. Amber, a fossilized resin that excels at preserving fine morphological details, provides critical characters for comparative analysis with extant lineages. The Cretaceous amber deposits of present-day Myanmar have yielded critical insights into the evolutionary history of fern lineages, particularly their early divergence. In this study, we report a novel and morphologically unique tree fern (Dicksoniaceae, Cyatheales) from the mid-Cretaceous of Myanmar, a discovery that provides key morphological character data for calibrating future phylogenetic analyses.

METHOD

The material studied is a pinnule with reproductive organ preserved in the Cretaceous amber deposits of present-day Myanmar. The age of Myanmar amber was assigned to an earliest Cenomanian age of 98.79 ± 0.62 Ma by a U-Pb zircon dating of the sedimentary matrix of the amber-bearing beds [1]. The amber specimen is housed at the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences. Preparation involved trimming with a water-fed saw and grinding and polishing with a lap to expose the inclusions. Fossil specimen images were captured using a Zeiss Stereo Discovery V16 microscope system (Carl Zeiss, Germany), utilizing both incident and transmitted light in most cases. All images were arranged and labeled in plates using Adobe Photoshop CS4.

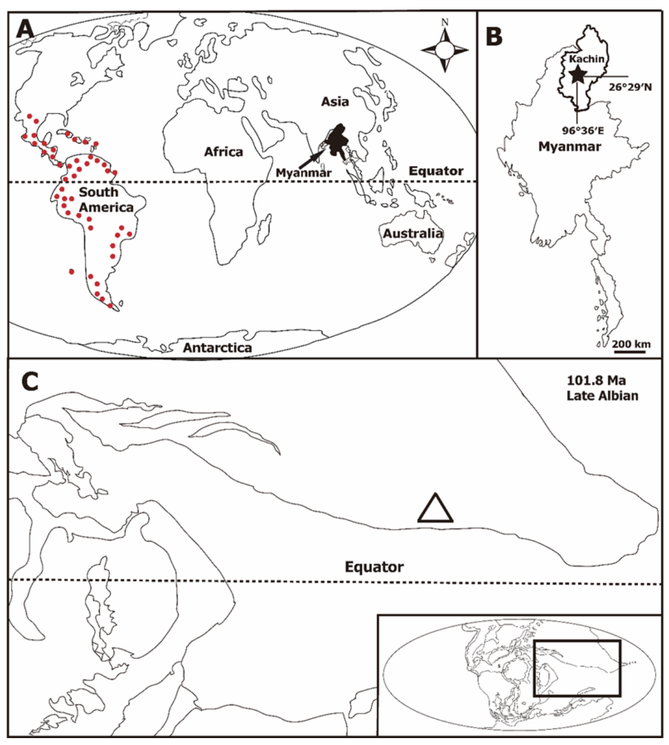

Figure 1. Geographic and paleogeographic maps of Myanmar amber deposits, adapted from Yu et al. [2]. (A) A part of the world map showing the present-day location of Myanmar (black area, indicated by a black arrow) and the distribution of extant *Lophosoria* (red dots, based on Tryon and Tryon [3]). (B) A map of Myanmar highlighting the location of the Cretaceous *Lophosoria* fossils from Kachin (denoted by a black star). (C) A paleogeographic map illustrating the position of Myanmar amber site (black triangle).

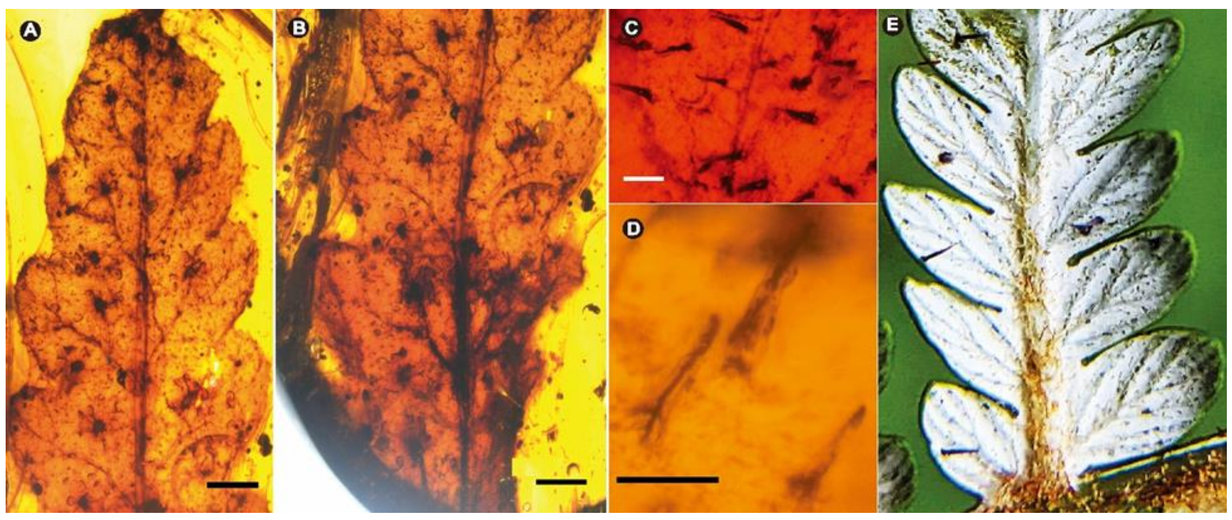

Figure 2. Pinnule and associated hairs of the holotype of *Lophosoria myanmarica* sp. nov. (PB205825, A-D) compared with the extant *Lophosoria quadripinnata* (E). (A) Apex of the pinnule; (B) Base of the pinnule. (C-D) Abaxial surface of *L. myanmarica* pinnule showing hairs at varying magnifications. (E) Abaxial surface of *L. quadripinnata* pinnule displaying black hairs (image sourced from https://www.fernsoftheworld.com, posted by H. T. Brent). Scale bars: 1000 μm (A-B), 100 μm (C), and 50 μm (D).

RESULTS & DISCUSSION

The new fossil was designated as a new fossil taxon belonging to the Order Cyatheales (Dicksoniaceae) and is here described as *Lophosoria myanmarica* sp. nov., based on a fertile pinnule with reproductive organ preserved in the Cretaceous amber deposits of present-day Myanmar. The *in situ* spores correspond to the dispersed spore genus *Cyatheacidites*, enabling a direct link between the sporomorph and its parent plant. The fossil displays a combination of distinctive characters in the fertile pinnule—most notably its uniquely flanged spores—which is unprecedented among both extant and fossil species of *Lophosoria*.

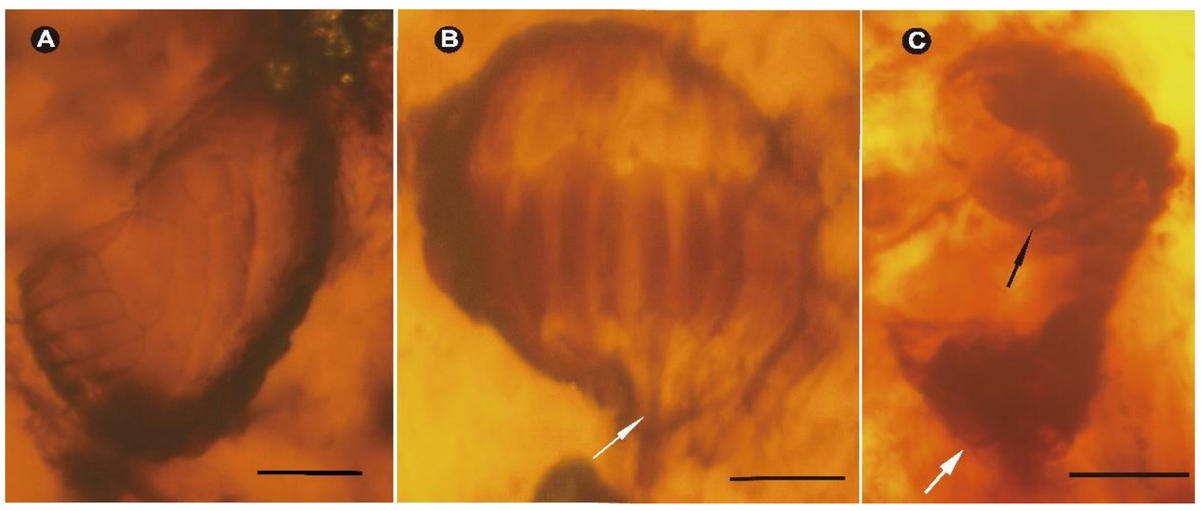

Figure 3. Sporangia of the holotype of *Lophosoria myanmarica* (PB205825). (A–C) Sporangia with oblique annuli; sporangial stalks indicated by white arrows in B and C. A single trilete spore is enclosed within the sporangium, showing distinct flanges (black arrow in C). Scale bars: 50 μm (A–C).

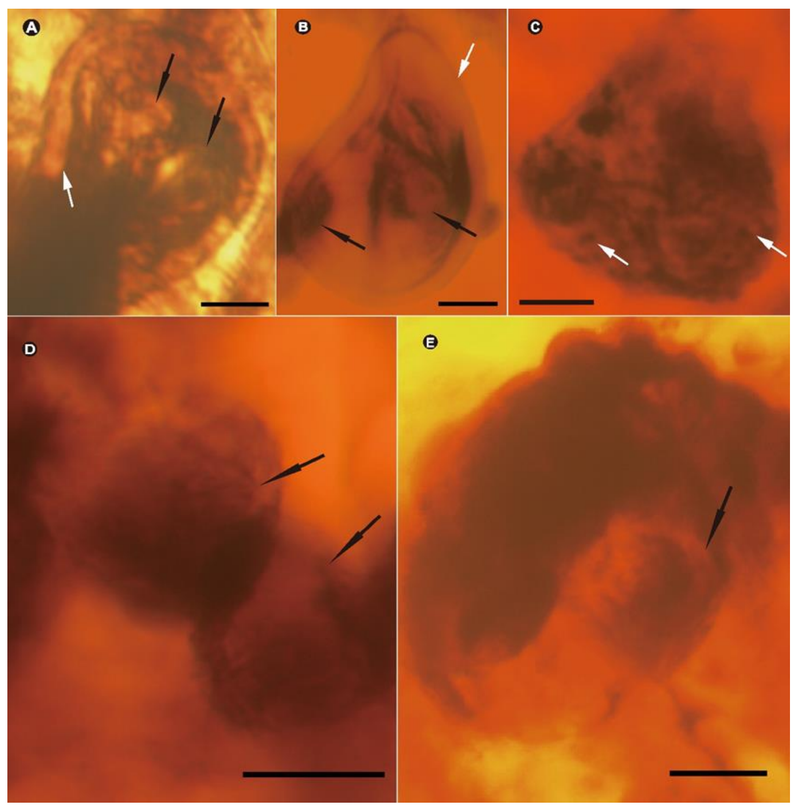

Figure 4. Spores of the holotype of Lophosoria myanmarica sp. nov. (PB205825). (A-C) Isolated trilete spores observed on the abaxial surface of the pinnule: (A-B) Proximal surfaces of the spores showing prominent equatorial flanges (white arrows) and swollen areas (black arrows); (C) Distal face of spore, clearly pitted (white arrows). (D-E) Trilete spores enclosed within sporangia, with visible flanges (black arrows). Scale bars: 10 μm (A-C), 20 μm (D), and 50 μm (E).

CONCLUSION

The new species *Lophosoria myanmarica* differs from both extant and previously described fossil species of *Lophosoria*, displaying distinctive pinnule morphology and expanding the known geographic range of the genus. These features provide new evidence for reconstructing the evolutionary history of *Lophosoria* and a basis for further interpretations of the paleobiogeographic and paleoecological evolution of *Lophosoria*.

FUTURE WORK / REFERENCES

1. Shi, G.-H.; Grimaldi, D.A.; Harlow, G.E.; Wang, J.; Wang, J.; Yang, M.-C.; Lei, W.-Y.; Li, Q.-L.; Li, X.-H. Age constraint on Burmese amber based on U–Pb dating of zircons. Cretac. Res. 2012, 37, 155–163.
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3. Tryon, R.M.; Tryon, A.F. Ferns and Allied Plants with Special Reference to Tropical America; Springer-Verlag: New York, 1982.