

A 24-million-year-old secret unearthed by the discovery of fossil leaves, found to be familiar in the Makum Coalfield of Assam

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In the dense layers of ancient coal beds in northeast India, scientists have unearthed a leafy secret that rewrites the story of South Asia's biodiversity.

The research was sparked by the discovery of fossil leaves that some scientists found to be familiar in the Makum Coalfield of Assam — a region long known for its fossil wealth.

A team of researchers from the Birbal Sahni Institute of Palaeosciences (BSIP), Lucknow, an autonomous institute of Department of Science and Technology (DST), collected the fossil leaves, analysed their morphological traits, and identified them through herbarium comparison and cluster analysis.

They found it resembling modern plant species of *Nothopegia* genus, which grows thousands of kilometers away, deep in the rain-drenched forests of the Western Ghats — a UNESCO World Heritage Site and one of the world's most important biodiversity hotspots.

These fossilized leaves, dating back around 24–23 million years to the late Oligocene epoch, were the world's oldest known fossil record of a plant genus called *Nothopegia*. Strangely, the genus is not found in northeast India anymore.

The scientists traced the journey of the species from the Northeast of the subcontinent to the Western Ghats in the study published in the journal Review of Palaeobotany and Palynology.

Back in the late Oligocene, the climate of Northeast India was very different. Using advanced techniques like the Climate Leaf Analysis Multivariate Program (CLAMP), scientists reconstructed a warm, humid climate — much like what the Western Ghats experience today.

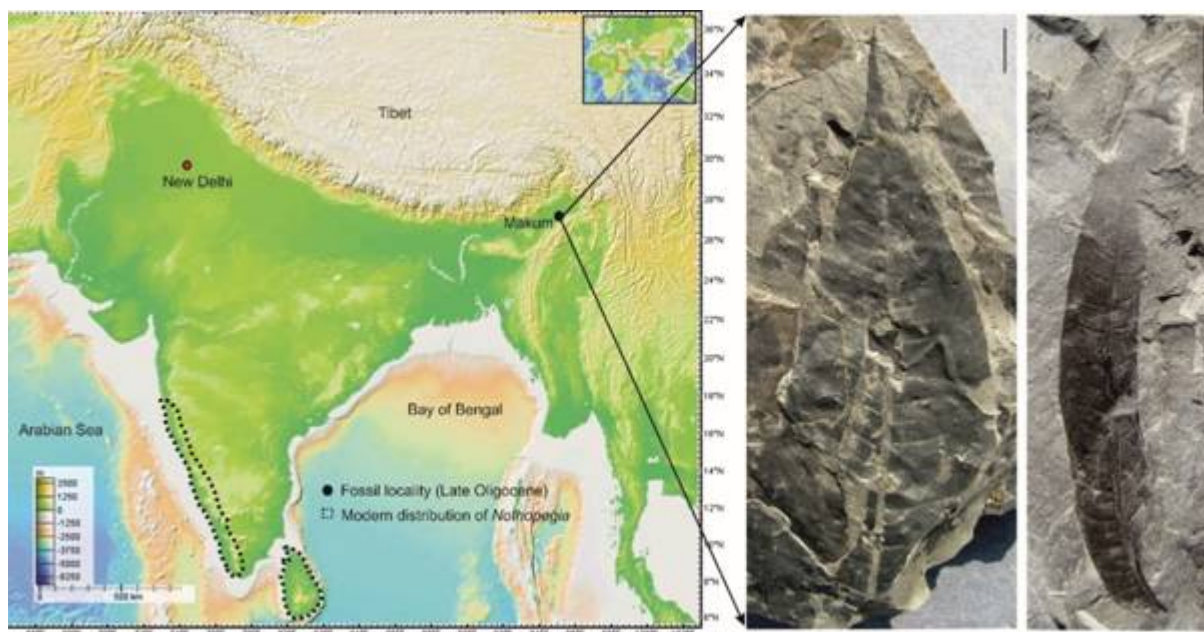


Fig: *This diagram explains how climate change over millions of years caused the disappearance of Nothopegia from northeast India, while the species survived and became endemic to the Western Ghats. The fossils date back to ~24 million years ago.*

This suggested that the ancient environment of northeast India once provided a perfect home for *Nothopegia*. But over millions of years, monumental forces reshaped the landscape. The Himalayas began their dramatic rise due to tectonic movements, bringing with them sweeping changes in temperature, rainfall, and wind patterns. These geological convulsions cooled the northeast, rendering it inhospitable for many tropical plant species, including *Nothopegia*, which vanished from the region. Yet, the species survived in the climatically stable Western Ghats, making it a living relic of an ancient ecological past.

The tracing of the changes was possible through a combination of paleobotany, systematics, and climate modelling — a powerful multidisciplinary approach that lets us peer millions of years into the past.

But this is more than a tale of disappearing leaves — it's a glimpse into how ecosystems evolve under pressure and how some lineages survive dramatic environmental shifts.

The study shows that extinction and migration driven by climate change is not new — they've been shaping our planet's biodiversity for eons. But unlike ancient climate shifts, today's changes are happening at an unprecedented pace, driven by human activity.

Understanding how *Nothopegia* once migrated and found refuge helps scientists predict how modern plants might respond to global warming. It also highlights the importance of protecting biodiversity refuges like the Western Ghats, where ancient lineages continue to persist against the odds.

As co-author Dr. Harshita Bhatia puts it, "This fossil discovery is a window into the past that helps us understand the future." Her team's work adds a critical piece to the puzzle of how India's rich biodiversity can be saved from the climatic challenges ahead.

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