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Cover: Life and death in one night - wolf hunting the hare. Mixed media—gouache, acrylics, pen & colour pencils. © Dupati Poojitha.

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SHORT COMMUNICATION

New record of *Sapria himalayana* Griff. (Rafflesiaceae) from Eaglenest Wildlife Sanctuary, Arunachal Pradesh, India

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Abstract: The eastern Himalayan region is renowned for its exceptional and abundant floral and faunal biodiversity, harbouring numerous endemic plant species. Among them, *Sapria himalayana* Griffith, an endoparasitic, rare, and endangered plant, was first discovered in the Mishmi Hills of Arunachal Pradesh in 1836. Despite its discovery nearly two centuries ago, the species remains poorly understood. While some recent studies have begun to explore the genetics and demography of this species, there is still a significant knowledge gap in the understanding of the life history patterns of this parasitic plant. Here, a new record has been added to the distribution of *Sapria himalayana* from Eaglenest Wildlife Sanctuary, West Kameng District, Arunachal Pradesh. Around 21 flowers were scattered on the forest floor, spanning various developmental stages from buds to flower maturation, including desiccated flowers. The bud emerges from the roots of *Tetrastigma* sp. (host plant). One of the primary challenges in conducting extensive research on the intriguing Himalayan Sapria is its infrequent and unpredictable flowering patterns. Therefore, understanding these aspects (flowering phenology and enigmatic traits) is crucial for further research and preserving this rare species and its hosts in the face of ongoing habitat loss. Conducting an annual plant survey in the Eaglenest Wildlife Sanctuary can help identify patterns to unravel these mysteries.

Keywords: Distribution, endangered, endoparasitic, flowering phenology, host plant, Himalayan region, *Tetrastigma* sp.

Sapria himalayana Griffith., (Rafflesiaceae) is a rare and endangered flowering plant (Nayar & Sastry 1987). All three genera of the Rafflesiaceae family are endoparasites, thriving within their grapevine (Vitaceae) hosts (Nikolov et al. 2014). *Sapria* and its two sister clades, *Rhizanthes* and *Rafflesia*, have lost the genes required for photosynthesis and rely entirely on obligate host species for sustenance (Osathanunkul 2019). Unusually, these parasitic angiosperms do not have an external vegetative body, only the solitary flower bud, which emerges from the host's roots and matures to a unisexual flower for brief periods to complete the life cycle. The hosts of *S. himalayana* include various *Tetrastigma* vines (*T. obovatum, T. cruciatum, T. laoticum, T. bracteolatum,* and *T. serrulatum*) recorded from Thailand and northeastern India (Elliott 1990; Arunachalam et al. 2004).

The genus *Sapria* has four species (Dorji et al. 2022). Among them, only *S. himlayana* has a wide distribution, and the other three species, *S. poilanei* Gagnep., *S. ram* Bänziger & B. Hansen., and *S. myanmarensis* (Tanaka et al. 2019) are endemic and have small ranges. *S. poilanei* is endemic to Cambodia, *S. ram* is endemic to

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Thailand, and the recently discovered *S. myanmarensis* is endemic to Myanmar (Bänziger et al. 2000; Holden 2010; Tanaka et al. 2019). The Himalayan Sapria was first described by the British botanist William Griffith in 1844, which was discovered by him in 1836 from the Mishmi Hills of Arunachal Pradesh, India (Griffith 1844; Dorji et al. 2022). After its discovery, it has been reported only a few times from other regions of northeastern India (Borah & Ghosh 2018; Ahmad et al. 2020; Devi et al. 2022; Singh et al. 2022; Syiemiong et al. 2022). Its distribution range includes Bhutan, northeastern India, Tibet, south-central China, Myanmar, Thailand, and Vietnam (Dorji et al. 2022). The flower of *S. himalayana* is unique and exceptionally beautiful. It is velvety and has 10 distinct perigone lobes. The flower emits a putrid odour. Previous studies have reported that the release of the foul odour attracts insect pollinators that pollinate the dioecious flower (Bänziger 2004; Davis et al. 2008). Very few studies have documented fruiting; fruits are black, 3.1–5 cm long, with a low fruiting rate (Bänziger 2004). The seeds are blackish-brown and 0.6–0.65 mm long, and rodents perform seed dispersal (Bänziger 2004; Borah & Ghosh 2018).

Even though it was discovered almost two centuries ago, the comprehensive knowledge of Himalayan Sapria is still lacking. Here, a new record of *Sapria himalayana* from Eaglenest Wildlife Sanctuary, West Kameng District, Arunachal Pradesh is documented (Image 1). A previous study from 1938 documents the flower's presence from the same district in Aka Hills, near Rupa (Bor 1938; Dorji et al. 2022). That was the second-ever recorded instance of this wildflower. Following an 85-year interval, another record is now documented in this region. Eaglenest Wildlife Sanctuary (WS) is located in the West Kameng District of Arunachal Pradesh, India. Being a part of the Eastern Himalaya Global Biodiversity Hotspot, Eaglenest WS harbours diverse plant species. The WS covers an area of 217 km^2 with an elevation gradient ranging 500–3,300 m. Annual precipitation ranges from roughly 1,500 mm to over 3,000 mm (Mohan & Athreya 2011). The elevation gradient shapes diverse forest ecosystems, transitioning from tropical wet evergreen forest at lower elevations (below 1,000 m) to broadleaved subtropical (between 800–2,000 m), temperate forest at higher elevations (between 1,800–2,800 m), and above 2,800 m, temperate coniferous forest. The elevation gradient hosts various plant species, contributing significantly to the region's rich floral biodiversity. The critically

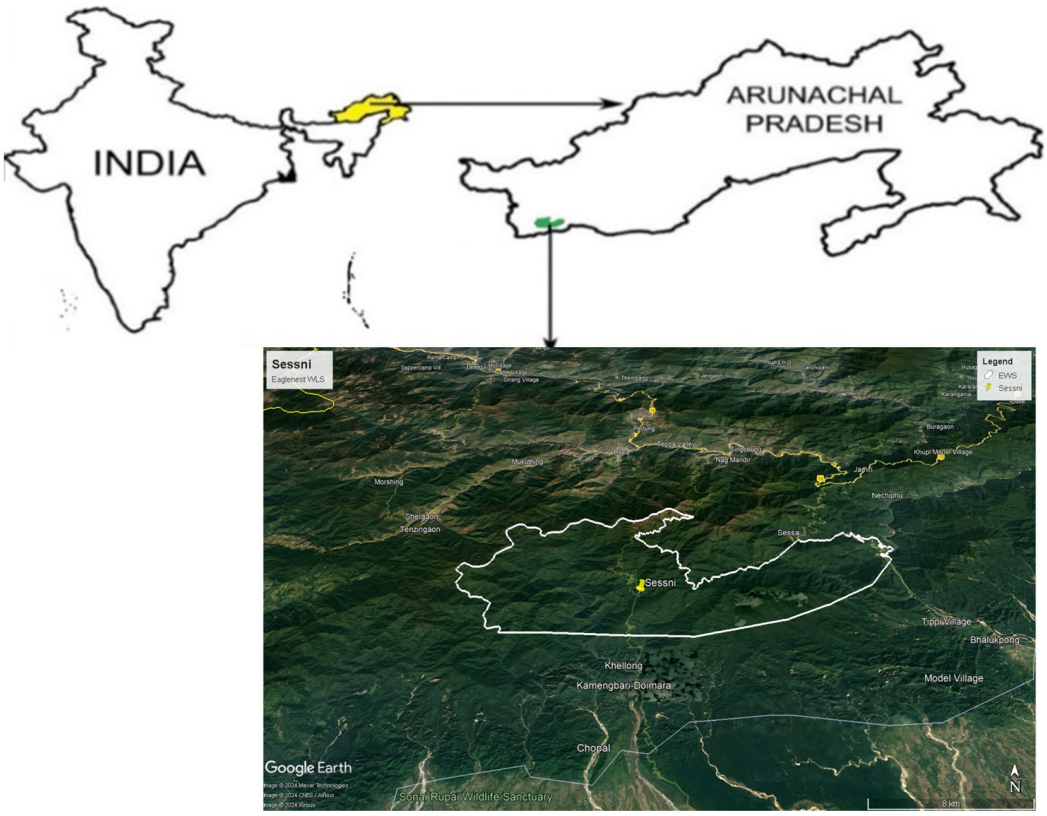

Image 1. The map shows the location of Sessni inside Eaglenest Wildlife Sanctuary, Arunachal Pradesh, India.

Image 2. A bud of *Sapria himalayana* on the forest floor emerging from the host's root.

Image 3. An individual flower of *Sapria himalayana* Griff. in its natural habitat.

Image 4. A naturally aborted *Sapria himalayana* bud beside a healthy bud.

Image 5. A decaying flower of *Sapria himalayana*.

Image 6. A *Sapria himalayana* flower with 12 perigone lobes.

Image 7. Measurements of the *Sapria himlayana* flower's diameter.

Image 8. Measurements of a *Sapria himlayana* mature bud.

Image 9. The host plant of *Sapria himlayana*, i.e., *Tetrastigma* sp. of Vitaceae.

endangered *Gymnocladus assamicus and valuable medicinal plants like Paris polyphyla are found at higher altitudes.* The dominant woody trees at lower elevations include *Magnolia hodgsonii*, *Ficus* spp., *Canarium resiniferum*, *Pinus roxburghi*, *Castanopis hystrix, Gynocardia odorata,* etc. Additionally, the understorey is dominated by *Elatostema platyphyllum*, *Strobilanthes hamiltoniana*, *Trivalvaria* sp., and *Achyrospermum wallichianum*.

In December 2023, five globose buds were encountered on the forest floor while walking along a trail in the primary forest. Following this initial observation, a systematic investigation was undertaken at the exact site on the next day. Each individual blooming flower was counted and the dimensions were measured (diameter and height) of flowers and buds. Each floral development stage was documented, including fresh buds, aborted flower buds, mature fresh flowers, and decaying flowers.

Accurate geographical coordinates and elevation data were captured using a GPS tracking device for precise locational mapping. Given that the species is IUNC Endangered, the exact coordinates of this record are not shared. Host plants associated with the parasitic flowers were photographed for later taxonomic identification. Subsequent identification of both the parasitic flower and its host plants was carried out using scientific literature and botanical resources.

The *S. himalayana* individuals were discovered near the Sessni camp of Eaglenest WS. Around 21 individuals spanning various developmental stages were observed, from bud emergence to flower maturation, including naturally decaying buds and decaying flowers (Image 2–5). The buds cluster in groups of three or five, scattered across the forest floor. Most flowers grew on gentle slopes, but some were found on level ground. A nearby water stream may fulfil the specific habitat requirements of this species. The flowers of *S. himalayana* are vibrant red, with sulphur-yellow dots on their perigone lobes. Most of the flowers have 10 perigone lobes in count. An individual *S. himalayana* flower with 12 perigone lobes (Image 6) is also recorded, contrasting with past published literature indicating the flower typically exhibits 10 perigone lobes. The flower was roughly 20 cm (Image 7) in diameter and about 12 cm tall. A mature bud was 12 cm wide (Image 8). The flower emits putrid smells that can be detectable from a few meters away. The vegetative parts of *S. himalayana* grow inside the host's lianas of *Tetrastigma* spp. (Image 9) of Vitaceae. During the reproductive phase, the protocorm emerges from the hosts' roots and then matures into a flower—the flower blooms in the winter, from November to February.

Eaglenest WS faces significant environmental challenges, including climate change and the spread of invasive plants at lower elevations. In this context, *Sapria himlayana* is a poorly understood taxon and highly sensitive to environmental factors. The plant has a naturally high bud mortality rate (Osathanunkul 2019). Extensive research on the fascinating Himalayan Sapria has been challenging because of its infrequent, unpredictable, and secretive flowering patterns. The study underscores the urgent need for comprehensive research into the elusive flowering phenology and enigmatic traits of *S. himalayana* to inform practical conservation efforts. In order to establish patterns and solve these mysteries, an annual plant survey is proposed in the Eaglenest WS. Apart from the West Kameng of Arunachal Pradesh, Namdapha National Park

of Changlang District is this plant's most extensively documented habitat (Arunachalam et al. 2004; Borah & Ghosh, 2018). Recent observations also indicate its presence in other parts of Arunachal Pradesh, including the evergreen forests of the East Siang District and the Mehao Wildlife Sanctuary in the Lower Dibang Valley District (Ahmad et al. 2020; Taram et al. 2020).

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