A rare root parasitic plant (*Sapria himalayana* Griffith.) in Namdapha National Park, northeastern India

Parasitic plants exhibit a whole variety of specializations in morphology, anatomy, physiology and reproductive biology[1]. They vary from chlorophyllous, facultative hemiparasites (Olacaceae, Opiliaceae, Krameriaceae) to obligate hemiparasites (Viscaceae, Loranthaceae) to holoparasites (Balanophoraceae, Hydnoraceae, Lennoaceae, Rafflesiaceae). Nonetheless, such plants are rare and restricted in distribution and are confined to virgin forests, particularly in the humid tropics. Thorough exploration and mapping of the interesting and lesser known endemic taxa will facilitate information regarding the distributional range and habitat distinctiveness of particular taxa that may help in designing proper conservation measures. Nevertheless, Namdapha National Park (lat 27°23′30″N to 27°39′40″N and long 96°15′2″E to 96°58′33″E; 1985 km^2; 200–4571 m asl) has been internationally recognized along with four more sites in the Indian subcontinent, viz. Agastyamalai Hills, Nallamalais, Nilgiri Hills and Nanda Devi Biosphere Reserve for data-sheet treatment[2]. This correspondence reports on the population status and conservation issues of a rare and endangered parasitic plant *Sapria himalayana* in Namdapha National Park, which has limited distribution around the world and was first reported from the tropical wet-evergreen forests of northeastern India by Griffith[3].

S. himalayana Griffith., the rare and interesting root parasite needs special attention due to its botanical curiosity and sensitivity to human disturbances on Namdapha forest vegetation by resettlers outside the park boundary (Figure 1). It has been included under the endangered category in the *Red Data Book* of the Botanical Survey of India[4]. *S. himalayana* is a holoparasitic herb belonging to the family Rafflesiaceae. Some of the most unusual and spectacular parasitic plants like *Rafflesia* also belong to this family. They are extremely specialized, obligate holoparasites, often with narrow distributional range. These plants represent the extreme manifestation of the parasitic mode, being totally dependent on their host for water nutrients and photosynthates. They get attached to both the xylem and the phloem and suck by means of highly specialized haustoria. The flowers of *S. himalayana* are ca. 20 cm across, dioecious, unisexual, bright red in colour covered with sulphur-yellow spots (Figure 2). They appear above the ground and have a putrid odour. Flowering shoot is short, erect and unbranched. Buds are globose and have white and pink bracts. The flowering and fruiting occur during winter (December to February). They are most likely to be annuals, as we did not encounter the species during other monthly visits. The flower remains in its blooming stage for 2–3 days and after that it slowly dehisces and becomes dark in colour and subsequently decomposes slowly. Fruits are swollen and crowned with perianth. The seeds are of the size of a grape fruit and blackish-brown in colour. Seed dispersal in *Sapria* has not been documented. A fortnight of observation revealed that no flies or any other animals were visiting this plant to act as pollination or dispersal agents. The vegetative tissue consisted of microscopic strands which ramified through the root cambium of the host plants. *S. himalayana* was first reported from Mishmi Hills in Lohit district[3] and subsequently from Aka Hills in Kameng district[5] of Arunachal Pradesh in northeastern India. It was also distributed in Assam, Manipur and Meghalaya[6]. But, till recently, there has been no report of this species from these states. At a global level, *S. himalayana* has been reported only from northeastern India and Thailand[6].

The species was found only in four patches in Zero camp area of the national park and two patches in the primary forest at Hornbill; these two areas were inhabited by Bangladeshi immigrants before the declaration of the park in 1983. The patch size ranged approximately, between 2 m × 2.5 m and 4 m × 4 m. The host plants of this holoparasite in Namdapha are *T. bracteolatum* (Wallich) Planchon

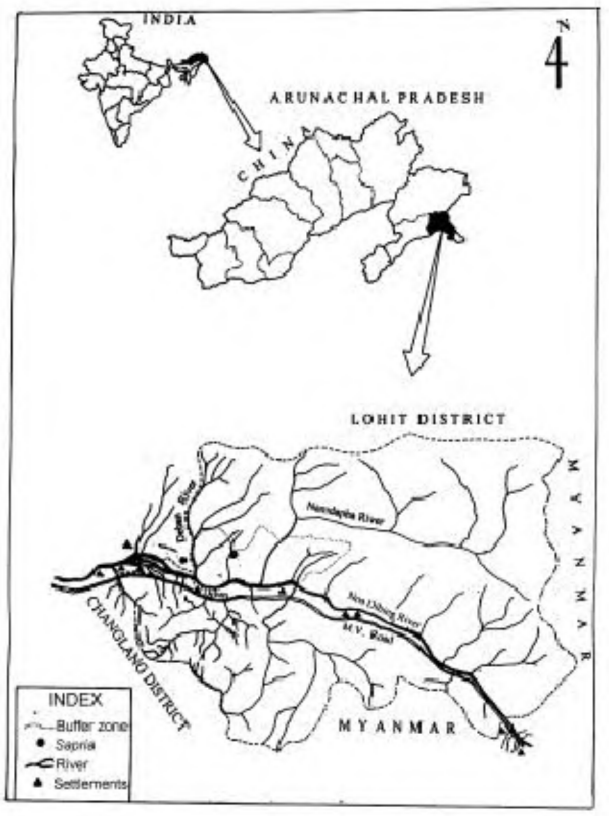

Figure 1. Map of Namdapha National Park.

Figure 2. *Sapria himalayana* in its natural habitat in Namdapha. (***a***) Live flower and (***b***) dead flower.

and *Tetrastigma serrulatum* (Roxb.) Planchon, both belonging to Vitaceae. *T. bracteolatum* is a wiry and glabrous climber with woody stem. The flowers are whitish and the fruits (berry) are black. The species was found fruiting during the study period. *T. serrulatum* is also a wiry glabrous climber, but with adhesive tendrils. The flowers are green in colour and the plant was not in fruiting stage (February). Both the hosts are lianas and were found to be common in the distributional range of *Sapria*. Apart from the host plant, other associated plants growing in the vicinity are *Fissistigma polyanthum*, *Saprosoma tarnatum*, *Commelina paludosa*, *Piper* sp., *Chisocheton paniculatus*, *Talauma hodgsonii*, *Dysoxylum binectariferum* and *Dysoxylum procerum*. Earlier, a large population of *Sapria* was reported from the 40th mile area of the park[7]; now there is no sign of its existence. However, further long-term observations are needed.

Namdapha National Park has become a refugia to *Sapria*. For how long the species will remain conserved, is a matter of great concern. The primary/virgin forests of Namdapha have been experiencing biotic disturbances that are mainly human-centred (e.g. shifting cultivation, settled cultivation, NTFP extraction). Encroachments exist in several parts of the park area, including the core zone (Figure 1). Our survey inside the park revealed the existence of about 50 households in the park area, which are mainly involved in settled as well as shifting agriculture. Encroachments are continuing inside the park area. Further, camping inside the park is a common affair enroute (3–4 days trekking) the eastern end of the park (Gandhigram and Vijaynagar). All these factors may lead to dwindling of the habitat for *Sapria*. Interestingly, we encountered patches of *S. himalayana* in the secondary forests being commonly used for need-based NTFP extraction by encroachers and resettlers outside the park boundary. This can directly impact the population of *Sapria*, with further degradation of the site. Personal interviews with local people and forest officials gave no fruitful information on the utility of the holoparasite, except for the beautiful flowers that bloom at times. The threats can be mitigated only by resettling the encroachers outside the park area and by making them aware of biodiversity and conservation through environmental campaign. Proper laws should also be formulated for sustainable harvest of NTFPs from inside the park area, and should be restricted to the buffer zone of the park. Alternative land-use development outside the park would also help in reducing pressure on the nature reserve.

However, we do not know enough about any gene, species or ecosystem to be able to calculate its ecological and economic worth in the larger scheme of things[8]. Although it is not clear how the elimination of this species will impact the overall stability of the ecosystem, *S. himalayana* needs special attention for conservation due to its limited distribution, biological curiosity and genetic rarity. Conservation of the species is not possible by germplasm collection or any *ex situ* measures. Rather, the viable approach should be of *in situ* conservation, keeping its habitat in natural condition. Any other method of conservation like its cultivation, is not possible due to its host specificity in parasitism.

1. Meijr, W., *Rafflesiaceae*. In *Flora Malesiana*, Rijksherbarium, Leiden, 1996.
2. WCMC, *Global Biodiversity*, Chapman Hall, London, 1992.
3. Griffith, W., *Journals of Travels in Assam, Burma, Bhutan, Afghanistan and the neighbouring countries*, Calcutta, 1847.
4. Nayar, M. P. and Sastry, A. R. K., *Red Data Book of Indian Plants*, Botanical Survey of India, 1988.
5. Bor, N. L., *Indian For. Rec.*, 1938, **1**, i–ix, 103–221.
6. Chauhan, A. S., Singh, K. P. and Singh, D. K., *A Contribution to the Flora of Namdapha, Arunachal Pradesh* (ed. Hajra, P. K.), Botanical Survey of India, 1996.
7. Sharma, B. D., Chauhan, A. S. and Wadhwa, B. N., Proposed Namdapha Biosphere Reserve, Arunachal Pradesh, Botanical Survey of India, 1990.
8. Ehrenfeld, D., In *Biodiversity* (ed. Wilson, E. O.), National Academic Press, Washington DC, 1988.

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