A note on the distribution of *Balanophora polyandra* Griff. (Balanophoraceae) in and around Neora Valley National Park, West Bengal, India

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Abstract

Balanophora polyandra Griff. of Balanophoraceae is a root holoparasitic plant, is recorded from in and around the Neora Valley National Park in the Kalimpong district of West Bengal, India. *Rhopalocnemis phalloides* Junghuhn, another holoparasitic plant of the same family, which was earlier reported and is very rare within this National Park also been collected. Morphology, ecology and conservation status of *B. polyandra* are provided here with a photo plate for its easy identification. While examining the literature, the authors feel that this taxon has been inadequately reported from this area of West Bengal by the earlier workers and hence this communication.

Key words: *Balanophora polyandra*, Root holoparasite, Red List, Neora Valley National Park

INTRODUCTION

The plant world shows an amazing diversity in modes of nutrition. In contrast to the autotrophic green plants, a small but significant number of heterotrophic angiosperms have adopted strikingly different approaches for obtaining all or part of their food from other plants and even from animals. They include insectivorous plants those trap small animals to supplement their N₂ need. Some plants pierce their roots variously in the host tissue, forming haustoria and absorb food from the host. Again, in mycotrophic plants, some fungi enter into the tissue of host root and form a symbiotic system for survival (Heide-Jorgensen 2008).

Balanophoraceae, a small family of root holoparasites, is represented by two genera in India, viz. *Balanophora* J.R.Forster & G.Forster and *Rhopalocnemis* Junghuhn (Hansen 1972). In India, the genus *Rhopalocnemis* is represented by a single species, viz. *R. phalloides* Junghuhn (Balakrishnan 2012; Rai & Das 2013; Krishna *et al.* 2016), whereas *Balanophora* is represented by seven species and three varieties, viz. *B. abbreviata* Blume, *B. dioica* R.Br. ex Royle, *B. fungosa* J.R.Forster & G.Forster, *B. harlandii* Hook.f., *B. indica* (Arn.) Griff., *B. indica* var. *agastyamalayana* M.B.Viswanathan *et al.*, *B. indica* var. *minor* Eichler, *B. indica* var. *tirunelveliensis* M.B.Viswanathan *et al.*, *B. involucrata* Hook.f. & Thomson, *B. polyandra* Griff. (Balakrishnan 2012). In West Bengal, *R. phalloides* has already been reported (Rai & Das 2013; Krishna *et al.* 2016) while the genus *Balanophora* is represented by three species, viz. *B. abbreviata*, *B. dioica* and *B. polyandra* (Mallick 2010; Balakrishnan 2012; Chhetri *et al.* 2018).

The Neora Valley National Park (26°58'15" N to 27°42'00" N, and 88°40'01" E to 88°48'49" E) with 88 km² area situated on both sides of the Neora river is one of the oldest protected areas in India. Bordering Sikkim in the North and Bhutan in the Northeast, the National Park is located in the Kalimpong district of West Bengal. The altitude ranged from 180 m to 3,200 m supports a rich flora with numerous endemic species as a part of the

PLATE - I. *Balanophora polyandra* Griff. (Balanophoraceae). **A & B.** Male plants growing on forest floor; **C.** Male and female plants growing in close vicinity; **D & E.** Enlarged male flowers showing synandrium; **F.** A putative female plant; **G & H.** Full grown female plants.

Himalaya Biodiversity Hotspot. The difficult terrain makes this inaccessible area one of the last remains of undisturbed and unexplored wildernesses in West Bengal (Rai & Das 2002).

Balanophora polyandra in and around Neora Valley National Park:

During intensive floristic surveys in and around the Neora Valley National Park during 2015 to 2019, *Balanophora polyandra* was first observed under *Quercus* sp. at Rishyap (27°11'12" N, 88°65'26" E) in November, 2015 and later on it was spotted in between Rishyap and Lava (27°08'63" N, 88°66'15" E) in November, 2015. In October 2019, both *B. polyandra* and *R. phalloides* were spotted inside the Neora Valley National Park in many places like Bhotaykharka (27°02'19.4" N, 88°46'85.0" E), Chilbre (27°03'35.2" N, 88°46'22.5" E), Hillay, Malingay, Mouchuki (27°01'36.6" N, 88°47'10.1" E), Nine Mile, Tempola (27°03'97.1" N, 88°46'45.5" E), Thusum Khola (27°03'87.4" N, 88°46'86.4" E) and Thosum Peak (27°04'40.6" N, 88°45'74.1" E). For identification and confirmation, the herbarium specimens housed in ASSAM, BSHC and CAL herbaria were consulted.

Taxonomy

Balanophora polyandra Griff., Proc. Linn. Soc. London 1: 220. 1844; J.D. Hooker, Fl. Brit. India 5: 238. 1886; Balakrishnan in Balakrishnan *et al.* (eds.), Fl. India 23: 77. 2012.

Parasitic, dioecious, tubers clustered together forming a mass; single tubers subspherical, 1–3 cm across; branching from the base; surface granular with scattered stellate warty protuberances, 3–6 cm in diameter. Male inflorescence 5–15 cm long, 1–2 cm wide, terminal, ellipsoid with expanded flowers, racemose; pedicellate; flowers zygomorphic, numerous, spirally arranged in conspicuous vertical rows; synandrium laterally elongated, somewhat compressed subdiscoïd. Female inflorescence 3–7 cm long, 1.5–3.0 cm wide, terminal, ellipsoid to obovate, brick red; flowers zygomorphic, numerous and minute, arranged on main axis of inflorescence.

Distribution

B. polyandra is distributed in India (Assam, Arunachal Pradesh, Manipur, Maharashtra, Nagaland, Sikkim, West Bengal); Bhutan, China, Myanmar and Nepal (Hansen 1972; Shumei & Murata 2003; Mallick 2010; Balakrishnan 2012; Chhetri *et al.* 2016; O'Neill & Rana 2016).

Association

The preferred habitat of *B. polyandra* as observed by the authors is in the shaded forests along the hill slopes in association with angiosperms such as *Quercus lamellosa* Sm. (Fagaceae), *Castanopsis* sp. (Fagaceae), *Engelhardtia spicata* Blume (Juglandaceae), *Exbucklandia populnea* (R.Br. ex Griff.) R.W.Br. (Hamamelidaceae), *Juglans regia* L. (Juglandaceae) and in bamboo groves.

DISCUSSION

These fascinating root holoparasites were encountered in numerous locations during explorations in and around the Neora Valley National Park. *Balanophora polyandra* appears to be quite common inside the park. At Rishyap, in 2015, the cluster was with 8 – 10 individuals with both male and female plants. On the trekking route between Rishyap and Lava ten more populations were spotted in November, 2015. However, in November (2016), on the same route only two populations were documented. This indicated the threat encountered by the taxon in the manipulative zone of the National Park, where the preliminary observations of the populations of the taxon had been made. The detailed survey inside the National Park in 2019 recorded two populations of *B. polyandra* from the Mouchuki-Bhotaykharka route, 62 from Bhotaykharka-Thusum Khola, 34 from Bhotaykharka-Thusum peak and 12 from Bhotaykharka-Tempola.

A single population of *R. phalloides* was found on the way towards Thosum Peak from Bhotaykharka (27°04'348" N, 88°45'803" E) at an altitude of 2,170 m. Earlier, Rai and Das (2013) reported this taxon for the first time from West Bengal collected from Neora Valley National Park. Later, Krishna *et al.* (2016) again reported it from Neora Valley National Park.

Threat and Conservation Status

Based on IUCN Red List criteria Chhetri *et al.* (2018) were of the opinion that *B. polyandra* is a Least Concern (LC) species both in Sikkim and throughout the Eastern Himalaya due to its wide distribution and has stable population within several protected areas. In Sikkim, the taxon has been recorded from two protected areas, viz. Khangchendzonga National Park and Pangolakha Wildlife Sanctuary (Chhetri *et al.* 2018). From our observations in 2015 and 2016 on the trekking route between Rishyap and Lava, it can be concluded that the species can not tolerate in the manipulated habitat. But, it appears to be quite common inside the Neora Valley National Park as there are virtually no human interventions and the fragile natural habitats are well-restored, so the taxon is still Least Concerned (LC) within the confines of the National Park, but not in the localities outside. So, only *in situ* conservation can save this species and, however, its populations inside such Protected Areas are appreciable.

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