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Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India
Ph: +91 9385339863 | www.threatenedtaxa.org
Email: sanjay@threatenedtaxa.org

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Cover: Orange Oakleaf *Kallima inachus* with colour pencils and watercolor wash by Elakshi Mahika Molur adapted from a workshop by Lenin Raj.



Threats faced by *Humboldtia bourdillonii* Prain (Magnoliopsida: Fabales: Fabaceae), an endangered tree endemic to the southern Western Ghats, India

Jithu K. Jose¹ & K. Anuraj²

¹ Karakkadayil House, Nazareth Hill P.O, Kottayam, Kerala 686633, India.

² Karakkath Veedu, Anamangad, Aliparamba P.O., Malappuram, Kerala 679357, India.

¹ jithukjose1@gmail.com (corresponding author), ² kanuraj684@gmail.com

Forests cover nearly a third of the world's surface (Lee & Jarvis 1996), containing almost 60,000 tree species (BGCI 2022). According to the first Global Tree Assessment Report in 2021, almost 1/3rd of these tree species are threatened with extinction, of which 142 have already recorded as 'Extinct' (BGCI 2021). Of all the tree species 58% are single-country endemics (Beech et al. 2017). The report says that there are 2,603 tree species in India, of which 650 are endemic and 469 are under the threat of extinction (BGCI 2021). Western Ghats is one of the biodiversity hotspots in India with high floristic diversity and endemism (Jose et al. 2023).

The genus *Humboldtia* comprises nine species (Kumar et al. 2022), all of which are endemic to the Western Ghats, except *H. laurifolia* which is endemic to Sri Lanka. *Humboldtia bourdillonii* Prain is an Endangered species (World Conservation Monitoring Centre 1998) endemic to the southern Western Ghats, India. It is locally known as 'Adimundan' and belongs to the family Leguminosae and subfamily Caesalpinioideae. It is a medium-sized tree that grows up to 20 m in evergreen forests in the altitudinal range of 200–1,250 m. The species was first described by David Prain, based on the collections of T.F. Bourdillon from Peermade Ghats in 1894, then for the next 108 years there was no report or data about this species. In 2002, the Kerala Forest Research Institute

(KFRI) research team rediscovered this species from the Periyar Tiger Reserve. Now this species is facing serious ecological and man-made threats in its natural habitat.

We conducted extensive forest surveys in the southern Western Ghats region from June 2021 to March 2023 to study the population and ecology of *H. bourdillonii* in its natural habitat (Image 1). The information from floristic literature and herbariums helped us to plan the field surveys. The major population sites located were Kulamavu, Vagamon, and Arjunankotta-Poonkavanam forests in the Periyar Tiger Reserve of the Peermade plateau. The population studies showed that *H. bourdillonii* has an area of occupancy of less than 0.06 km² and an area of occurrence is approximately 2 km². The number of mature trees is less than 200.

There are irregularities observed in the flowering and fruiting of *H. bourdillonii* mainly owing to climate change. Generally, the flowers are produced in November–January, and fruiting is observed in January–May (Balan et al. 2019). The flowers are pollinated by wind, ants, and honey bees *Apis indica*. However, the intensity of pollinators has recently decreased. Young fruits are largely consumed by the Malabar Giant Squirrel *Ratufa indica*, which is also endemic to the Western Ghats. Insect infestation heavily affects the reproductive biology of *H. bourdillonii*. Jumping thrips

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Image 1. *Humboldtia bourdillonii*: A—mature tree | B—steep slippery terrain habitat with streams | C—view of flowers | D & E—damaged pods | F—reduction in seeds | G—processed seeds for seedling production. © Jithu K. Jose & Anuraj K.

multiply and colonize the young inflorescence and suck the sap of young fruits. Sixty percent of seeds are lost due to the damage caused by the weevils. Weevils penetrate the fruit wall and lay eggs in the cotyledons of the young embryo. The larvae grow at the expense of the cotyledons and the adults emerge out as the seeds get dispersed. The entire metamorphosis of the insect occurs within the fruit. The attack of weevils is more prominent during the months of April and May. The seed dispersal is carried out by dehiscing pods, the blasted seeds are scattered around the mother tree indicating

the short-distance gene flow within the population. This short-distance gene flow has affected the genetic diversity of this species (Rathmacher et al. 2010). The pre-monsoon rainfall is beneficial to seed establishment but recent abnormal monsoon flooding (started in 2018) wipes the seeds and hinders the soil seed bank of the species. The recalcitrant nature of the seed is also a cue factor affecting the regeneration of the species.

The conversion of forest areas in Vagamon and Peermede Ghats into tea and cardamom plantations has heavily affected the populations of *H. bourdillonii*.

This conversion was started during the 19th century British rule. Vagamon is a major tourist spot in Kerala, so tourism development has also negatively affected this species. The impact of recent abnormal flooding in Kerala triggered a number of landslides that affected the Vagamon Hill population of the species. Both locations (Vagamon and Peermede) of this species are identified as landslide-prone areas by the Kerala State Disaster Management Authority (KSDMA; Balan et al. 2019). In Kulamavu forest areas, commissioning the Idukki Dam reservoir may submerge the populations of the target species. So, the conservation of this endangered, endemic species is the need of the hour.

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Tamil Nadu 641006, India
ravi@threatenedtaxa.org

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