

Typification and distribution of *Ehretia longiflora* (Ehretiaceae) in India

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Abstract: In the present publication, the extended distribution of *Ehretia longiflora* Champ. ex Benth. (Ehretiaceae) on the mainland India (Neora Valley National Park, Sikkim-Darjeeling Himalaya) is reported and its conservation status is discussed. In India, the species was previously reported only from Hope Town in South Andaman. After a critical literature review, we found that the name needs to be lectotypified. An identification key to the species of *Ehretia* in India is also provided.

Keywords: Endangered, Extinction risk, Neora Valley National Park, Sikkim-Darjeeling Himalaya.

Introduction

The genus *Ehretia* P.Browne (Ehretiaceae) comprises 65 accepted names globally (POWO, 2022) and has a pantropical distribution with centres of diversity in Central America, Africa, and East Asia (Miller, 1989; Rueangsawang & Chantaranothai, 2010; Mabberley, 2017; Rueangsawang *et al.*, 2019). Based on molecular data *Ehretia* is monophyletic (Gottschling & Hilger, 2001) and morphologically characterised by a bifid style with two stigmatic branches and drupaceous fruits with either undivided, two-, or four-parted endocarps. The individual parts of the two- and four-parted endocarps are termed endocarpids and enclose two seeds or one seed each, respectively, while undivided endocarps contain four seeds (Gottschling & Hilger, 2004). The genus was earlier treated under subfamily Ehretioideae of Boraginaceae but recent phylogenetic studies

classified it under Ehretiaceae (Boraginales) (Gottschling *et al.*, 2014; Luebert *et al.*, 2016). In India, the genus is represented by 12 species (Clarke, 1883; Santapau & Henry, 1973; Mill, 1996, 1999; Alappatt, 2018; Meena *et al.*, 2020) which includes *Ehretia acuminata* R.Br. (Fig. 1a), and *E. aspera* Willd. (Fig. 1b) distributed almost throughout India, *E. dichotoma* Blume (Fig. 1c), *E. longiflora* Champ. ex Benth. (Fig. 1d) and *E. timorensis* Decne. (Fig. 2c) in Andaman & Nicobar Islands, *E. macrophylla* Wall. (Fig. 1e) in Manipur and Sikkim, *E. matthewii* Kottaim. (Fig. 1f) and *E. wightiana* Wall. ex G.Don (Fig. 2e), endemic to India and distributed in eastern India and Tamil Nadu, *E. obtusifolia* Hochst. ex A.DC. (Fig. 2a) in Gujarat, Punjab, and Rajasthan, *E. microphylla* Lam. (Fig. 1g) widespread in Andaman & Nicobar Islands, Andhra Pradesh, Karnataka, Kerala, Maharashtra, Pondicherry, and Tamil Nadu, *E. psilosiphon* R.R.Mill (Fig. 2b) in West Bengal, and *E. wallichiana* Hook.f. & Thomson (Fig. 2d) in Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. The members of *Ehretia* contain phenolic acids, lignans, flavonoids, nitrile glycosides, quinonoid, steroids, triterpenoids and pyrrolizidine alkaloids which show various biological activities (Li *et al.*, 2010; Shukla & Kaur, 2018). Many species of *Ehretia* are used in traditional medicine in India and China (Shukla & Kaur, 2018). The roots of *E. longiflora* contain 12 known compounds which show anti-tubercular and anti-inflammatory activities (Chien *et al.*, 2012).

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During the floristic exploration of the Neora Valley National Park, a few specimens of tree species were collected from the Sakam forest area of the lower Neora range. The plant materials were studied with the help of the relevant literature (Clarke, 1883; Johnston, 1951; Zhu *et al.*, 1995; Mill, 1996, 1999; Pal, 2016; Alappatt, 2018) and herbarium specimens housed at CAL and digital images at K, E, P, PE, and TI and their identity confirmed as *E. longiflora* which was earlier recorded from the Andaman & Nicobar Islands, India (Alappatt, 2018), and Southeast China, Taiwan and Vietnam (POWO, 2022). The first report of its presence in the Sakam forest of the Neora Valley National Park, Sikkim-Darjeeling Himalaya in West Bengal, extended its distribution to the mainland of India. As far as conservation status of this species is concerned, its population in the Neora Valley National Park is very small and so far, the species was only observed in one location, which is evident of its extremely rare distribution in the national park. In addition, an identification key for the Indian *Ehretia* species is also provided.

Taxonomic Treatment

Ehretia longiflora Champ. ex Benth., Hooker's J. Bot. Kew Gard. Misc. 5: 58. 1853; Gagnep. & Cour. in Lecomte, Fl. Indo-Chine 4: 210. 1914; H.L. Li, Woody Fl. Taiwan 812. 1963; Z.Y. Zhu, Riedl & Kamelin in Z.Y. Wu & P.H. Raven, Fl. China 16: 335. 1995; J.Y. Hsiao & H.Y. Liu in T.C. Huang, Fl. Taiwan ed. 2, 4: 395. 1998; Alappatt, Rheedia 28: 105. 2018. *Type*: Lectotype (designated here): **Hong Kong**, *s.coll.*, *s.n.* (K [K000998019 digital image!]). *E. glaucescens* Hayata, Icon. Pl. Form. 3: 153. 1913. *Type*: FORMOSA (Taiwan), Kizan prope Mai, B. Hayata & S. Sasaki, *s.n.* (holo TI [TI00206176 digital image!])

Figs. 1d & 3

Trees, up to 15 m tall, deciduous. Leaves elliptic to oblong-oblancheolate, 6–13 × 2–5.5 cm, base slightly oblique to cuneate, margins entire, apex abruptly acute to acuminate or short-caudate, greenish and shining above sub-coriaceous, glabrous on both surfaces; lateral veins 6–7 pairs, prominent beneath; petioles 1–2.3 cm long, glabrous. Inflorescence axillary cymes,

flat topped, densely flowered, 3–6 cm wide; peduncles 2–3 cm long, glabrous. Flowers *c.* 10 mm long, sweetly scented, sub-sessile or on short and thick pedicels; bracts absent. Calyx 1.5–2.5 mm long, pubescent; tube *c.* 1 mm long; lobes ovate, *c.* 1 × 1 mm, margins ciliate. Corolla creamy to greenish white, drying dark brownish, tubular-campanulate; tube *c.* 10 mm long, slightly pubescent outside, glabrous inside; lobes 5, ovate to elliptic-ovate, 2–3 mm long, shorter than tube, spreading, soon becoming reflexed. Stamens 5, inserted 3.5–5 mm above base of corolla tube; filaments white, filiform, 7–9 mm long, glabrous; anthers exerted from corolla, oblong-ovoid, *c.* 1 mm long. Ovary ovoid, *c.* 1 mm, glabrous; style slender, *c.* 10 mm long, greenish in colour, bifid above, glabrous; branches *c.* 1 mm long; stigma greenish, capitate; ovules 4. Drupes greenish, yellow orange when ripen, globose to sub-globose, 7–9 mm across, with styler remnant, glabrous.

Flowering & fruiting: Flowering from March to April, fruiting from May to September.

Habitat: Growing in evergreen forest, at 400–500 m elevation.

Distribution: India, Southeast China, Taiwan and Vietnam.

Specimen examined: INDIA, **West Bengal**, Neora Valley National Park, lower Neora range, Sakam to Dovan, N 26°59'35.7", E 88°45'57.2", 446.4 m, 03.06.2019, V. Ranjan, G. Krishna & A. Kumar 80678 (CAL).

Conservation status: *Ehretia longiflora* is known from Southeast China, Taiwan, India and Vietnam (POWO, 2022) and its global conservation status was assessed by Lai, Y., Botanic Gardens Conservation International (BGCI) & IUCN SSC Global Tree Specialist Group (2019) as Least Concern (LC). In India, this species is reported so far only from two localities, *i.e.*, the eastern part of the South Andaman Islands (Hope Town) and Sikkim-Darjeeling Himalaya (Sakam forest area) (Fig. 3). In the Neora Valley National Park in the Sikkim-Darjeeling Himalaya, this species is facing serious threats since the quality of the habitat is dwindling due to cliff displacement, water drains from the hill-top and a preference for tourism and



Fig. 1. Photographic images of *Ehretia* P.Browne occurring in India: **a.** *E. acuminata* R.Br. **b.** *E. aspera* Willd. **c.** *E. dichotoma* Blume **d.** *E. longiflora* Champ. ex Benth.; **e.** *E. macrophylla* Wall. (CAL0000071574); **f.** *E. matthewii* Kottaim. (CAL0000035527); **g.** *E. microphylla* Lam. (photos by a&g K.Karthigeyan; b Gopal Krishna; c M. Chennakesavulu Naik; d Vinay Ranjan; e&f ©The Director, Botanical Survey of India, Kolkata).



Fig. 2. Photographic images of *Ehretia* P. Browne occurring in India: **a.** *E. obtusifolia* Hochst. ex A. DC. (CAL0000009709); **b.** *E. psilosiphon* R. R. Mill; **c.** *E. timorensis* Decne.; **d.** *E. wallichiana* Hook. f. & Thomson; **e.** *E. wightiana* Wall. ex G. Don (photos by a ©The Director, Botanical Survey of India, Kolkata; b Anant Kumar; c M. Chennakesavulu Naik; d R. Gogoi; e R. Kottaimuthu).

recreational activities, as well as the gathering of wood by the local people who rely on trees as biological resource. Apart from the known distribution, there are no data available on the existence of other populations of the species in other parts of India. Therefore, the data are found to be insufficient to place the taxon into a category, and the species is assessed here as “Data Deficient” based on the IUCN categories and criteria (IUCN, 2022).

Typification: Bentham (1853) described *Ehretia longiflora* based on the collection of Captain Champion of the 95th Regiment for the flora of the island during his stay from 1847–1850 in Hong Kong. While studying the species, we found that the protologue without a type or collection details

is part of Bentham's enumeration of species, which was prepared with Champion's help and published part by part in ‘*Hooker's Kew Journal of Botany*’ in volumes 3 to 7 and 9. Bentham (1861) mentioned that Champion sent a complete collection of specimens, along with sketches and descriptions done on the spot, as well as the most valuable notes relating to specific location, height, colour, and other factors to him, which he eventually donated to Kew in 1854 (www.anbg.gov.au/biography/bentham.george.html). All the specimens and manuscripts deposited by Champion are at Kew (Staffeu & Cowan, 1976). We found four sheets collected by Champion at Kew (K000998017; K000998018; K000998019 & K000998020 digital images!) with the stamp ‘HERBARIUM BENTHAMIANUM 1854’. The sheet (K000998017) bears two fragments, one with only flowers, the other with leaves and fruits. As Bentham stated “*Fructus non visus*” [Fruit not seen] in the protologue. Therefore, the sheet K000998017 cannot be considered as syntype. The remaining three sheets (K000998018, K000998019, K000998020) bearing flowering fragments must be considered as syntypes (Art. 9.4 of the ICN; Turland *et al.*, 2018). The sheet K000998019 bears two fragments and the annotation “*Ehretia longiflora* Champ Benth. in Kew Journ. Bot.” in Bentham’s handwriting. It also bears drawings of gynoecium and ovary added by Bentham, which was stated in the protologue as “*Stylus apice breviter bifidus, lobis dilatatis truncatis sub-retusis. Ovarium carnosum, glabrum; loculis 4 parvis.....*” [Style apex shortly bifid, lobes dilated, truncate to sub-retuse. Ovary fleshy, glabrous; locules 4, small]. Therefore, the specimen K000998019 is the best choice for lectotype designation and we designate here the same.



Fig. 3. Distion map of *Ehretia longiflora* Champ. ex Benth. in South Andaman Islands and Sikkim-Darjeeling Himalaya; (drawn using Geocat, <http://geocat.kew.org/>, Bachman *et al.*, 2011)

Key to the species of *Ehretia* in India

- 1. Styles 2 or 1, slender and bifid to near the base *E. microphylla*
- 1. Style 1, bifid less than half way down 2
- 2. Leaf margins serrate 3
- 2. Leaf margins entire 4

3. Leaves lanceolate to ovate-lanceolate or oblong, indistinctly petiolate, 4–7-nerved on each side; inflorescences glabrous; calyx *c.* 1.5 mm long; corolla 2–2.5 mm long *E. acuminata*
3. Leaves broadly ovate to obovate, distinctly petiolate, 9-nerved on each side; inflorescences crispate hirsute; calyx *c.* 4 mm long; corolla 6–8 mm long *E. macrophylla*
4. Flowers solitary *E. psilosiphon*
4. Flowers in cymes or corymb inflorescence 5
5. Inflorescence cymose 6
5. Inflorescence corymbose 8
6. Leaves apex obtuse to sometimes retuse
..... *E. obtusifolia*
6. Leaves apex acute or acuminate 7
7. Leaves apex acute; calyx-lobes ovate, glabrous; fruits pale–yellow or red *E. longiflora*
7. Leaves apex acuminate; calyx-lobes oblong, ciliate on margins only; fruits green
..... *E. wallichiana*
8. Leaves elliptic *E. matthewii*
8. Leaves otherwise 9
9. Leaves base long attenuate *E. wightiana*
9. Leaves base rounded to truncate 10
10. Inflorescence sparsely hairy; leaf apex acute to acuminate; calyx campanulate or cup-shaped11
10. Inflorescence glabrous; leaf apex obtuse or imarginate; calyx triangular *E. timorensis*
11. Leaves lanceolate; calyx campanulate; style free *E. dichotoma*
11. Leaves oblong; calyx cup-shaped; style divaricately forked up to middle *E. aspera*

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