

**NOTES RELATING TO THE FLORA OF BHUTAN:
XXXV. BORAGINACEAE, III.
Ehretia wallichiana: a tangle disentangled**

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The taxonomy and typification of *Ehretia wallichiana* Hook.f. & Thomson and allied species (Boraginaceae, subfamily Ehretioideae) are discussed. *E. wallichiana* is lectotypified; the species occurs from Nepal to Assam. The identity of *Cordia acuminata* Wall. is discussed and the name is lectotypified. Its type is here treated as *Ehretia silvana* R.R. Mill *nom. nov.* Three new species, *E. exsoluta* R.R. Mill *sp. nov.*, *E. psilosiphon* R.R. Mill *sp. nov.* and *E. dolichandra* R.R. Mill *sp. nov.*, are described and their affinities discussed. A key to all the species of the '*E. wallichiana* complex', together with confusable species occurring from India to China, is given.

Keywords. Bangladesh, E Himalaya, India, lectotypification, new species.

INTRODUCTION

Ehretia P. Browne (Boraginaceae, subfamily Ehretioideae Gürke) comprises about 50 species, distributed in Africa, Asia and the Neotropics. The New World species were revised by Miller (1989); no corresponding up-to-date account of the Old World species exists. About 10 species occur in the Indian subcontinent; the only 'complete' treatment of these remains that of Clarke in Hooker (1883). Johnston (1951) recognized 11 species in an area comprising China, Taiwan, Japan and 'northern Indo-China' (principally northern Vietnam). The taxonomy and nomenclature of some species is problematic. This paper unravels the intricacies of the taxonomy of a group of taxa within *E. sect. Beurreria* P. Browne, to all of which the name *Ehretia wallichiana* Hook.f. & Thomson has hitherto been given.

Examination of numerous sheets identified as *E. wallichiana* suggests that the material is heterogeneous and that more than one species should be recognized. This heterogeneity extends to the specimens used to draw up both the first detailed description of *E. wallichiana* and the type description of *Cordia acuminata* Wall., one of its supposed synonyms. Consequently it is necessary to choose lectotypes which best stabilize the application of both names and preserve current usage of the former. The result of this work and allied taxonomic research is the recognition of five species (four new) within what has hitherto been regarded as *E. wallichiana*, namely *E. wallichiana* Hook.f. & Thomson (here lectotypified), *E. dolichandra* R.R. Mill, *E. exsoluta* R.R. Mill (= *Cordia acuminata* Wall. p.p., excl. lectotype), *E. psilosiphon* R.R. Mill (= *E. wallichiana* p.p., excl. lectotype) and *E. silvana* R.R. Mill (*nomen novum* for *Cordia acuminata* Wall. as lectotypified here, non *Ehretia acuminata* R.

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Br.). The lectotypification of the names *Ehretia wallichiana* Hook.f. & Thomson and *Cordia acuminata* Wall. is discussed below, followed by a key and taxonomic treatment of the taxa recognized.

LECTOTYPIFICATION OF *EHRETIA WALLICHIANA*

E. wallichiana Hook.f. & Thomson, as currently understood (e.g. Clarke in Hooker, 1883; Kanjilal et al., 1939), is a usually small tree up to 12(–24)m tall, inhabiting Nepal, Sikkim, Darjeeling, Bhutan, NE India and possibly also Myanmar (Burma), with small, sweetly scented white corollas which have reflexed lobes.

The name *E. wallichiana* Hook.f. & Thomson was first published in Gamble (1878: 57), for a plant described as a small tree of the lower and middle hill forest from 2000–6000ft, flowering in May and fruiting June–July. It was said to resemble *E. laevis* Roxb. but having much smaller leaves and occurring at lower altitudes. Hooker & Thomson's brief description is sufficient to validate the name under Art. 32 of the ICBN (Greuter et al., 1994), but contains scarcely any information which helps to identify the taxon. Moreover, no specimens were cited from which a lectotype could be chosen. Hence, other information has had to be used to lectotypify the name. Fortunately, Hooker & Thomson's account contains evidence that conclusively determines the choice of lectotype. However, Clarke's later account (in Hooker, 1883: 143), in which he took up the epithet and provided the first full description of the species, is much more detailed and helpful; recourse has had to be made to it, as well as to the specimens that would have been available to both Hooker and Clarke at K. One such sheet comprises two specimens (*Clarke* 26613A and *Clarke* 27912A), both collected in 1875, three years before *E. wallichiana* was validly published; *Clarke* 26613A bears detailed notes and a dissected fruit, which suggest that Clarke may have used it to draw up his description. As *Clarke* 26613A would also have been available to Hooker, it could be a suitable choice for lectotype but there are stronger grounds for selecting other material.

Clarke's 1883 account consisted of a diagnosis ('nearly glabrous; leaves elliptic acuminate, corolla tube much exceeding the calyx') and a full description as follows: 'A tree, attaining 40 ft., flowering before the leaves. Leaves 5 by 2 in., base cuneate nerves 7 pair; petiole ½ in. Corymbs 1–3 in. diam., mostly sublateral. dense, minutely pubescent. Calyx-lobes ¼ in., oblong. Corolla ½ in.; lobes ¼ in., white, recurved. Anthers exsert. Ovary 2-celled, cells 2-ovulate; style bifid much less than half-way down, stigmas small capitellate. Drupe ¼ in. diam., subglobose, when dry longitudinally ribbed; pyrenes 4, compressed, lunate, corrugated without, occupying the periphery of the drupe, the centre (in the dried drupe) hollow, occupied by the shrivelled fleshy tissue; pyrenes 1-seeded. – Perhaps a small-flowered form of the Hong-Kong *E. longiflora* (Champ. in Hook. Kew Journ. v. 58), which agrees exactly as to the fruit and leaves, but has the corolla-tube ½ in. long'. The account was based on several specimens from 'Sikkim and Bhotan, alt. 2–7,000 ft., frequent, *J.D.H.* etc.: Khasia Mts., *Wallich, Griffith*'. Clarke also cited as the only synonym '*Cordia acumin-*

ata Wall. Cat. 896, and in Roxb. *Fl. Ind.* ed. Carey & Wall. 2: 339; DC. *Prodr.* 10: 499'. Indeed, one could argue that, in transferring *C. acuminata* to *Ehretia*, Clarke was having to give it a 'new' name (Hooker's epithet *wallichiana*) because of the existence in *Ehretia* of the prior name *E. acuminata* R. Br. (The latter refers to an Australian species whose name has frequently been misapplied to an Indian *Ehretia*, whose correct name is *E. serrata* Roxb.). However, Hooker & Thomson significantly did not cite the synonym *C. acuminata* in their protologue; thus, the inclusion of *C. acuminata* must be considered a later addition by Clarke, not relevant to the lectotypification of the name *E. wallichiana*.

The earliest appearance of the name *E. wallichiana*, and its earliest publication, were not simultaneous. Its earliest *appearance* seems to be on the labels of the Griffith sheets of the taxon, from 'Sikkim' and *Bhutan* (see below). These labels (dated 1862-3) bear the name in handwriting; the sheets form part of the Kew distribution of Griffith's material, which took place after Griffith's death. J.D. Hooker was responsible for sorting out the Griffith herbarium (Lamond, 1970); thus Hooker's first concept of his *E. wallichiana* may well have been based on the two Griffith specimens which were distributed as H.E.I.C. 6001 (a number in a block, 5806-6181, inadvertently used twice: Lamond, 1970). However, Hooker's name appears to have languished in unpublished limbo for some time, since its first *published application*, by Hooker & Thomson in Gamble's *List of the trees . . . in Darjeeling District, Bengal*, was not until 1878. There, the name was used for plants from *Darjeeling*, with no explicit mention of Griffith's specimens. This could imply that Hooker & Thomson were now basing their new taxon upon material collected in *Darjeeling*, either by themselves or by other collectors such as Clarke or Gamble. Although Gamble's *List* cited no specimens, according to its Preface the work was wholly or partly based upon specimens collected by Gamble himself, together with 'a nearly complete set' of C.B. Clarke's *Darjeeling* collection which Clarke had given to Gamble.

The Wallich material of E. wallichiana

This is of prime interest, not only because of Hooker & Thomson's choice of the epithet *wallichiana*, implying some (unstated) link with Wallich or plants collected by him, but also because of the citation by Clarke of *Cordia acuminata* Wall. in the synonymy of his later treatment. However, these supposed connections between *C. acuminata* and *E. wallichiana* should not be used to argue that the lectotype of *E. wallichiana* should be chosen from Wallich material. Such a choice would present no problems if all the original material were homogeneous. However, the Wallich plants (numbered *Wallich 896* and *Wallich 896 B*) differ from the *Darjeeling* specimens in so many characters that they cannot be considered to represent the same species. Consequently, any possibility of lectotypifying *E. wallichiana* by one of the Wallich specimens must be rejected. If any of them were chosen, the current taxonomic application of the name *E. wallichiana* would be changed, contrary to Code Recommendation 9A.5 (Greuter et al., 1994). There is in any case no direct evidence

that Hooker saw them; we do know that he saw the Griffith, Clarke and Gamble specimens, as well as his own collections. The Wallich specimens are discussed later, in connection with the lectotypification of *Cordia acuminata*.

The Griffith specimens of E. wallichiana

Two specimens labelled '*E. wallichiana* H.f. & T.' at K represent original material. Both are numbered Griffith H.E.I.C. 6001 but they are differently localized. One, here referred to as Griffith H.E.I.C. 6001 'A', is labelled 'Sikkim'; the other, referred to as Griffith H.E.I.C. 6001 'B', is labelled 'Bootan' and bears a Journal label (no. 917). Griffith's *Itinerary Notes* (Griffith, 1848: 178) show that H.E.I.C. 6001 'B' was collected from above Telagong in Panukka (Punakha, Bhutan). Griffith's field description reads: 'Arbor mediocris floribus albis odoratis infundibulif.'; the plant was unnamed. Since Griffith never visited Sikkim, one must assume, without further evidence, that Griffith H.E.I.C. 6001 'A' labelled 'Sikkim' is a duplicate of the Telagong specimen.

Griffith H.E.I.C. 6001 'A' has flowers in dense sublateral corymbs. The corolla tube, and the outside of the lobes, is sparsely pubescent. The style is about 8mm long, divided to c. 1/4 way down, with indistinct, flat-topped stigmas. The elliptic, shortly acuminate leaves have 6(-7) pairs of veins. Griffith H.E.I.C. 6001 'B' is similar but the inflorescence is largely in bud with virtually no open flowers. Because of their stage of development, neither could have been used by Clarke to draw up his very detailed description of the fruit, which forms an important part of his account of the species. (His source of information was presumably principally Clarke 26613A and other fruiting specimens collected by Clarke and Gamble). Griffith's description 'Arbor mediocris' would have been available both to Hooker & Thomson and to Clarke; it agrees perfectly with Hooker's 'small tree' but hardly fits Clarke's description of a 'tree attaining 40 ft.' (again, the source was presumably Clarke's field notes as noted on some of his specimens).

Choosing either of the Griffith specimens as lectotype poses no problems in respect of the current application of the name *E. wallichiana*. Indeed, since one was received from Kew in a type cover (the other was not), there are strong grounds for doing so. An important factor favouring lectotypification by Griffith material is the fact that the name was first *used* (although not *published*) in 1862/3 on the Griffith labels.

The case for lectotypification by non-Griffith material

As mentioned above, Clarke 26613A (K), collected at Kurseong (Darjeeling) on 5 vi 1875, three years before Gamble's *List* was published, would be an excellent choice as the lectotype of *E. wallichiana*. The argument for choosing a specimen other than the Griffith sheets rests mainly on the fact that Clarke, Gamble and Hooker specimens are known to have been used in the preparation of Gamble's *List* whereas it is not known whether Griffith material was so used. Although a choice from among

the non-Griffith material would be perfectly acceptable, there is evidence, discussed below, that favours the Griffith material being used.

Choice of lectotype

The Griffith specimens and the Clarke, Gamble and Hooker material are conspecific. Consequently, if a lectotype was selected from either, the current application of the name would be maintained. (This would not be the case if *Wallich* 896 or 896 B were used; their status is discussed below). Hence, the final choice of lectotype is determined by any information provided by Hooker & Thomson (rather than Clarke) which conclusively settles the matter. Hooker & Thomson merely stated that *E. wallichiana* was a small tree, similar to *E. laevis* but with 'much smaller' leaves; this brief statement, however, supplies crucial evidence.

E. laevis is a large shrub or tree to c.10m, widespread from China to India and Pakistan (Johnston, 1951; Hara et al., 1982; Nasir, 1989). It seems to be rare in the Himalayas; only one example has been seen from the *Flora of Bhutan* area. It differs from *E. wallichiana* in its shorter calyx, smaller corollas, anthers half as long (c.0.7mm, not c.1.5mm), and orange drupes, but has similar-sized leaves (6–18 × 5–11cm). The size of the leaves provides the required evidence that determines my choice of lectotype. In Clarke's material of *E. wallichiana* from Darjeeling, they measure 8.5–16 × 3.5–7cm, wholly within the range of *E. laevis*. Those of the Griffith specimens are 3–9 × 1.5–4.5cm. This agrees with Hooker & Thomson's statement about *E. wallichiana* having much smaller leaves than *E. laevis*. Hence, it is concluded that *E. wallichiana* should be lectotypified by one of the Griffith sheets. (The smallness of the leaves on these sheets probably reflects their immature state; the leaves on Clarke's material, which is mature, are larger and probably full-size). Griffith's material was distributed to 19 herbaria (Lamond, 1970: 165); many may have followed Kew and assumed Griffith H.E.I.C. 6001 to be the type. The choice of Griffith material as the lectotype (in spite of its small, immature leaves) is further strengthened by Griffith's observation (1848: 178, no. 917) that the flowers were 'odoratis'; this adjective normally refers to a sweet scent (Stearn, 1966: 472), which is the type of odour possessed by *E. wallichiana* as usually understood. Other plants, formerly included in *E. wallichiana* but here separated as *E. psilosiphon*, have bad-smelling flowers that would be not normally be described as 'odoratis'.

Of the two Griffith specimens, the one localized 'Sikkim' (H.E.I.C. 6001 'A') is designated the lectotype because it alone shows the essential floral characters of *E. wallichiana*. The more accurately localized specimen from Bhutan (H.E.I.C. 6001 'B'), which remains a syntype, has not been chosen to lectotypify the name as its inflorescences are almost entirely in bud.

LECTOTYPIFICATION OF *CORDIA ACUMINATA* WALL.

Cordia acuminata Wall. was described in Carey & Wallich's edition of Roxburgh's *Flora Indica* (Roxburgh, 1824, 2: 339). His diagnosis was 'Arboreous, smooth. Leaves

oblong-ovate, acuminate, entire. Corymbs terminal, short, dichotomous, with infundibuliform flowers, and smooth, deeply divided calyces'. His full description reads: 'A middle-sized tree, with smooth, rounded branchlets. – *Leaves* scattered, longer than their interstices, measuring about five inches, ending in a short acumen, perfectly smooth, coriaceous, with acute base and parallel nerves underneath. *Petiol* [sic] an inch long, deeply channelled. – *Corymbs* of an oval form, short-peduncled, twice or thrice dichotomous, a little pubescent, with short unilateral spikes of infundibuliform white flowers; they are mostly produced while the tree is quite naked of leaves. – *Corolla* smooth, with the tube at least twice as long as the calyx, which is deeply divided into five, lanceolate, acute, ciliate lobes; *lacinae* bent backwards. – *Stamina* elevated above the throat, considerably shorter than the style, which is bifid at the apex. *Stigmas* crenulate, waved'.

Wallich stated that *C. acuminata* was 'a native of Silhet, where it was found in flower by Mr De Silva in February'. The specimen was numbered 896 in his *Numerical List* (Wallich, 1828–49: 26), which confirms that its origin was Silhet (part of Bangladesh), a much more low-lying and tropical area than Sikkim and Bhutan, where *E. wallichiana* was collected. The few species of *Ehretia* known from Silhet include *E. serrata* Roxb. (*E. acuminata* auct. non R. Br.; sect. *Ehretia*), which differs from *C. acuminata* in its paniculate inflorescence and serrate leaves; and *E. laevis* Roxb., discussed above in connection with *E. wallichiana*. *E. umbellulata* Wall., which like *C. acuminata* was described from Silhet by Wallich (in Roxburgh, 1824. 2: 344), is in fact *Ilex umbellulata* (Wall.) Loes.

Material numbered *Wallich* 896, corresponding to the number given to the type of *Cordia acuminata* Wall., has been seen from BM and K (including K-W where it was numbered 896.1 when the Wallich Herbarium was microfiched). An E sheet numbered *Wallich* 896 matches material from elsewhere numbered 896 B. Both *Wallich* 896 and *Wallich* 896 B are also present in K-W.

Wallich 896 B (*Numer. List.* p. 236, published in 1832) is listed among various *Cordia* species with a question mark but otherwise not identified. Its origin was 'H.B.C.' (i.e. material cultivated at the Botanic Garden, Calcutta). It should therefore be regarded as a separate entity from *Wallich* 896. However, clearly there has been confusion in the numbering when the sheets were distributed (a common feature of the Wallich distribution). Some sheets numbered 896 B belong to the taxon to which the number 896 should be attached and vice versa. Indeed, sometimes a sheet is a mixture of both taxa involved, with no indication from the numbering that this is so. The two taxa confused under *Wallich* 896/896 B are here informally referred to as '*Wallich* taxa 1 and 2'. Formal names are attached to them in the taxonomic treatment.

'*Wallich* taxon 1' – K-W (*Wallich* 896.1); one BM sheet and one K sheet, both numbered *Wallich* 896 (not 896 B). The K-W example of *Wallich* 896 comprises two elements. One of these is possibly unique to that sheet as I have seen no duplicates identical to it. This element, mounted on the top right-hand part of the sheet, has

mature leaves and a few flowers which are past anthesis. The remainder of the sheet is occupied by a specimen with many inflorescences and a few immature leaves; its buds agree in their relatively large size and dark colour with those on most (not all) sheets distributed elsewhere as *Wallich* 896. Two labels are pinned to the top right-hand corner of *Wallich* 896.1: the upper one, grey, reads 'Cordia acuminata Wall. E Sylhet 1821' while the one beneath it (larger, brown) reads 'No. 341, Jentya Hills, March 1830'. To this latter label, '896' has been added in pencil, twice, one of these annotations having been deleted. I conclude that this brown label dated 1830 belongs to the specimen on the top right-hand part of the sheet [from the Jaintia Hills in Meghalaya]. Assuming this to be correct, this specimen was collected after the date of publication of the name, and so must be disregarded for lectotypification purposes. The BM sheet of *Wallich* 896 comprises a flowering branch lacking leaves, a large vegetative branch with scarcely any flowers, and a separate, much larger leaf. The K specimen is mounted on the top right of a sheet which also includes a collection, labelled *Cordia acuminata*, made in Khasia by Griffith; the elements on this sheet correspond to those cited under *E. wallichiana* by Clarke (in Hooker, 1883) as 'Khasia Mts., *Wallich, Griffith*'. The leaves on these specimens (except on the large branch on the BM sheet) are elliptic-acuminate. The flowers are about 9mm long, with a glabrous corolla tube which is the same rather dark brownish-black colour when dry as the lobes, and *erect* corolla lobes which for the most part do not appear to become reflexed until well after anthesis. The plant from which most of these fragments were taken is quite unlike any other member of the *E. wallichiana* complex. The large vegetative branch on the BM sheet does not belong to this taxon, but to the following one.

'*Wallich* taxon 2' – K-W; two E sheets (numbered *Wallich* 896, one localized Silhet); one E-GL sheet (numbered *Wallich* 896 B); a second BM specimen (numbered *Wallich* 896 B; preserved on same sheet as *Clarke* 26613D and *Clarke* 28011; and left-hand unnumbered branch of '*Wallich* 896 *Cordia acuminata*', BM). All this material is in flower, with young leaves, and lacks fruits. The leaves are broadly elliptic to suborbicular, obtuse or subacute (in no way acuminate). The corollas are c.3.5mm from base to mouth, shortly campanulate with a glabrous tube c.2mm which dries creamy-white (markedly contrasting in colour with the dried lobes) and strongly reflexed acute corolla lobes c.3mm which when dry are a noticeably darker, pinkish-brown colour than the tube (but paler than the corollas of BM and K *Wallich* 896 as described above). The anthers are c.0.8–0.9mm and the style c.5mm, very shortly bifid for c.0.5mm (c.1/10 of its length). The large branch with hardly any flowers on the BM sheet of *Wallich* 896 discussed under '*Wallich* taxon 1' is obviously part of this gathering; the one corolla seen on it matches those on other sheets of this taxon and is quite different to those of '*Wallich* taxon 1'.

Clarke (in sched., K-W) determined *Wallich* 896 B as *E. laevis* var. *floribunda* (Benth.) C.B. Clarke (*E. floribunda* Benth.). However, *Wallich* 896 B (K-W) has campanulate corollas and so cannot be *E. laevis*, which has 4–5mm, subrotate cor-

ollas. Clarke's varietal combination had been anticipated by Brandis (in Stewart & Brandis, 1874: 340), but Brandis's combination was invalid as he did not definitely accept varietal rank for it. Nasir (1989) treated *E. floribunda* as a synonym of *E. laevis*, with *E. laevis* var. *floribunda* wrongly attributed to Brandis.

Neither 'Wallich taxon 1' nor 'Wallich taxon 2' is conspecific with Griffith's plants, from which the lectotype of *E. wallichiana* has been chosen; the Griffith specimens differ from both in having much longer anthers and a longer, much more deeply divided style. Thus, Clarke (in Hooker, 1883) was incorrect to consider it synonymous with the latter. Given the heterogeneity of the material distributed as *Cordia acuminata* under both *Wallich* 896 and *Wallich* 896 B, the name *C. acuminata* must be lectotypified before any decisions are made concerning the taxonomic status of these two entities.

The specimens belonging to the taxon that should correctly be numbered *Wallich* 896 B (regardless of their actual labelling) all disagree in many respects with Wallich's protologue of *C. acuminata*, e.g. leaves obtuse, not acuminate; corollas shortly campanulate; stamens not 'considerably shorter than the style' (although the stamens and style are exerted from the corolla, the filaments are at first subequal to the style and finally exceed it, but bend backwards and so the style can appear longer than them); style very shortly bifid (for about $\frac{1}{10}$ of its length), with truncate entire (not 'crenulate, wavy') stigmas. These specimens presumably all represent *Wallich* 896 B, rather than 896, in spite of their confused numbering.

Wallich 896.1 (K-W, bottom left), *Wallich* Silhet 1829 H.I. 896 (K), and unannotated *Wallich* 896 (BM – p.p., excl. left-hand branch) agree much better with Wallich's protologue. Their leaves are shortly acuminate, and their corollas are infundibular with a tube 2.5–3 × as long as the calyx. However, their stamens, which are exerted from the throat, as Wallich described, but not from the corolla (on account of the suberect corolla lobes), are longer than the style, whose branches approximately reach the point of insertion of the anthers to the filaments (about $\frac{1}{3}$ way up from the anther base). The style itself is bifid for about $\frac{1}{4}$ of its length with crenulate, undulate, concave stigmas which agree with Wallich's description ('Stigmas crenulate, wavy'), unlike the stigmas of the other group of *Wallich* specimens. Taking all aspects of the protologue into account, it is concluded that:

1. Although there are minor discrepancies between them and the protologue, the specimens listed above under 'Wallich taxon 1' should be regarded as being part of the type material of *Cordia acuminata* Wall. From them, the K-W specimen is here designated the lectotype, the other two (Silhet 1829 H.I. 896, K; unannotated *Wallich* 896, BM – p.p., excl. left-hand branch), being isolectotypes. All specimens numbered *Wallich* 896 or 896 B which have small, campanulate corollas must consequently belong to *Wallich* 896 B (which is not *C. acuminata*), regardless of their actual numbering.

2. *Cordia acuminata* Wall. is not synonymous with *Ehretia wallichiana* Hook.f. & Thomson, and two distinct taxa have been distributed (as *Wallich* 896 and 896 B)

under the former name. Both belong to *Ehretia*, but neither appears to be conspecific with any other species. Consequently, both elements require new names. The epithet *acuminata* cannot be used in *Ehretia* for the element containing the lectotype of the name (Wallich 896), because the prior name *Ehretia acuminata* R. Br. exists. Thus, Wallich 896 needs a new name, whilst Wallich 896 B needs description as a new species. For the former ('Wallich taxon 1' or Wallich 896), the name *E. silvana* has been chosen, in commemoration of Francis de Silva, who made the original gathering and sent it to Wallich. For the latter ('Wallich taxon 2' or Wallich 896 B), the name *E. exsoluta* is used, as I have disentangled (*exsolvere*) its true identity from that of *Cordia acuminata* (*Ehretia silvana*), and recognized the distinctiveness of both of them from *E. wallichiana*.

Some specimens, identified by their collectors as *E. wallichiana*, can be assigned neither to that species nor to either *Cordia acuminata* Wall. (*E. silvana* R.R. Mill) or *E. exsoluta* R.R. Mill. They have glabrous corolla tubes as in *E. silvana* (not pubescent, as in *E. wallichiana*), longer anthers and a style which, though divided for about the same distance as *E. wallichiana*, is topped by distinctly convex stigmas. (In *E. wallichiana* the stigmas are very indistinct and flat-topped). These specimens are here described as *E. psilosiphon* R.R. Mill. Another specimen, again originally identified as *E. wallichiana*, cannot be considered to belong either to it or to *E. psilosiphon*; it is here described as *E. dolichandra* R.R. Mill.

TAXONOMIC TREATMENT

Key to species

The following key includes all members of the *Ehretia wallichiana* group treated here, together with some allied or superficially similar species. Species only mentioned in discussion are in parentheses and unnumbered.

- 1a. Filaments inserted just above base of corolla tube; corolla tube very widely flared outwards and upwards so that corolla is basin-shaped — (***E. confinis***)
- 1b. Filaments inserted near middle of corolla tube or towards its apex; corolla campanulate (sometimes shortly) to infundibular _____ 2
- 2a. Anthers ± medifixed, ovoid or oblong-ovoid _____ 3
- 2b. Anthers ± basifixed or sub-basifixed, usually linear to narrowly ellipsoid, occasionally ovoid _____ 5
- 3a. Filaments inserted at or near middle of corolla tube; corolla 11–13mm _____ (***E. longiflora***)
- 3b. Filaments inserted at or near top of corolla tube; corolla less than 11mm — 4
- 4a. Leaves developing mainly after flowering, with (4–)5 primary veins per side which diverge from midrib at an angle of (35–)40–55°; corymbs lax, flat-

- topped; corolla 4.5–5.5mm, lobes and tube subequal; filaments 1.5–2mm, anthers 0.9–1mm _____ **5. *E. exsoluta***
- 4b. Leaves \pm fully developed at flowering time, with 5–6(–7) primary veins per side which diverge from midrib at an angle of (57–)62–77(–80) $^{\circ}$; corymbs dense, hemispherical; corolla 6.5–11mm, lobes shorter than tube; filaments 6.2–7.5mm, anthers 1.1–1.5mm _____ **1. *E. wallichiana***
- 5a. Corolla 9–10mm (measured with lobes reflexed), rather suddenly expanded at throat _____ **4. *E. silvana***
- 5b. Corolla less than 9mm (measured with lobes reflexed), not suddenly expanded at throat _____ 6
- 6a. Calyx ciliate-margined but otherwise glabrous or only sparsely glandular- or eglandular-pubescent; reflexed corolla lobes normally surpassing base of corolla tube _____ **2. *E. psilosiphon***
- 6b. Calyx densely glandular over whole surface; reflexed corolla lobes shorter than or subequalling, but not extending beyond, base of corolla tube [if not extending beyond base, then calyx not densely glandular: *E. cf. psilosiphon*] 7
- 7a. Reflexed corolla lobes reaching almost to base of corolla tube; anthers 2.25–2.6mm; style c.9mm, its stigmatic branches subparallel and scarcely divergent, 0.7–1(–1.5)mm _____ **3. *E. dolichandra***
- 7b. Reflexed corolla lobes reaching to not more than $\frac{3}{4}$ way down corolla tube; anthers not more than 2.2mm; style 6.5–8mm, its stigmatic branches clearly divergent or not _____ 8
- 8a. Reflexed corolla lobes reaching to c. half-way down corolla tube; style 6.5–7mm, its stigmatic branches 1.2–2mm, clearly divergent (China) _____ **(*E. dunniana*)**
- 8b. Reflexed corolla lobes reaching c. $\frac{2}{3}$ – $\frac{3}{4}$ way down corolla tube; style c.8mm, its stigmatic branches c.0.7mm, hardly divergent _____ ***E. sp. A***
(see discussion under *E. psilosiphon*)

1. *Ehretia wallichiana* Hook.f. & Thomson in Gamble, List Trees Darjeeling 57 (1878); C.B. Clarke in Hook.f., Fl. Brit. India 4: 143 (1883). Lectotype (designated here): Specimen *Griffith* H.E.I.C. 6001 labelled 'Sikkim' (K). Syntype: [Bhutan, Upper Bumthang Chu district, Tolegang] *Griffith* H.E.I.C. 6001, labelled 'Bhutan', Journal no. 917 (K). **Fig. 1B.**

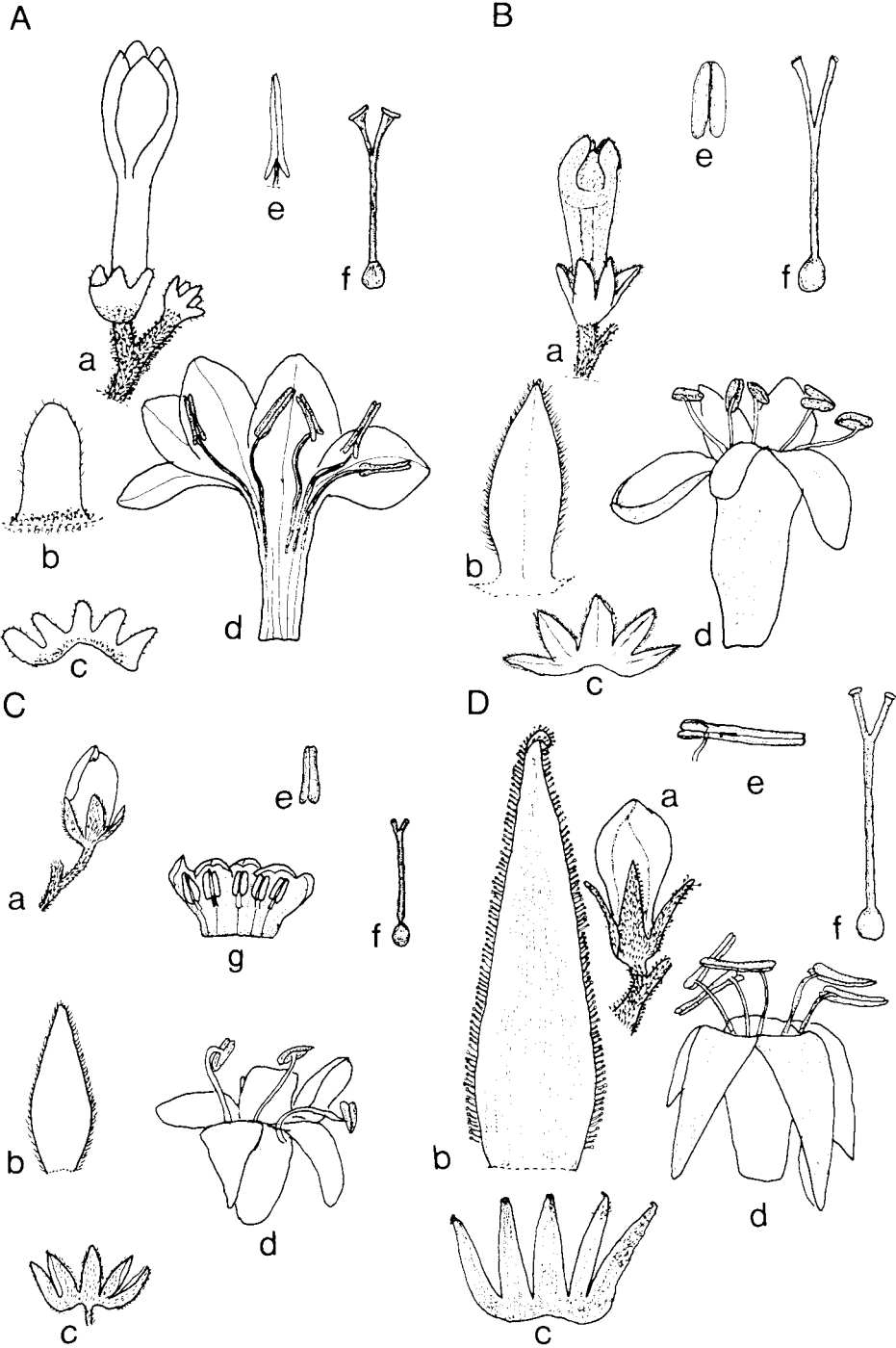
Shrub or medium-sized tree, (2–)5–12(–25)m, 1.2–1.5m maximum d.b.h.; young branches chocolate-brown, older ones greyish-brown, glabrous; leaf scars on young twigs indistinct (\pm same colour as twigs), transversely elliptic or transversely reniform. *Leaves* \pm fully developed at anthesis; petiole (6–)10–20(–40)mm, channelled on dorsal side; lamina coriaceous, elliptic, (25–)45–160 \times (12–)22–80mm, obtuse or usually shortly acuminate (sometimes both together on a branch, but acuminate

leaves always predominating, often the only type present), base cuneate or obtuse; upper surface \pm glabrous (except for a few short setiform hairs, mainly on midrib); lower surface glabrous; margin entire; veins 5–6(–7) per side, diverging at (57–)62–77(–80) $^{\circ}$ to midvein, prominent beneath and darker than lamina. *Inflorescences* lateral in axils of fallen leaves of preceding year, cymose; cymes compact, hemispherical, reniform or orbicular in outline, 15–30 \times 22–50(–70)mm; peduncles 8–25(–50)mm in flower, 15–30mm in fruit, subglabrous or sparsely glandular-pubescent; ultimate dichotomies c.3mm, densely glandular-puberulent; pedicels 0.5–1mm, densely glandular-puberulent (occasionally some flowers sessile on an ultimate branchlet which then appears as a c.3mm pedicel). *Bracts* absent. *Buds* clavate, pubescent. *Calyx* tube (0.5–)1–1.6(–2)mm, subglabrous; lobes at first suberect, becoming slightly patent, oblong-lanceolate, 1–2 \times 0.5–1mm, obtuse to acute, eglandular-ciliate-margined but otherwise glabrous. *Corolla* white, sweetly scented, infundibular, 6.5–11mm; tube drying dark brownish (rarely yellowish) with darker flutings, infundibular, 4–6.5mm, gradually dilated upwards, \pm densely puberulent with yellowish hairs either all over or in \pm broad lines along flutings; lobes erectopatent at first but very soon reflexed (when reflexed, not reaching base of corolla tube), lanceolate, 2.5–4.5 \times 1.5–2.6mm, acute or obtuse, minutely ciliate on margin and apex, or glabrous-margined, yellowish-puberulent outside, glabrous inside. *Filaments* dull white, 6.2–7.5mm, subequalling corolla lobes, attached to anther near its middle or in proximal $\frac{1}{3}$ (– $\frac{1}{5}$); anthers exerted from corolla, oblong-ovoid, 1.1–1.5mm. *Style* 7.3–8.2mm, \pm equally bifid, the branches (0.8–)1–2.2mm, gradually dilated upwards to indistinct, truncate and almost flat-topped stigmatic surfaces. *Fruits* green turning greenish-yellow or greenish-red, \pm globose, 5–7mm diam., turning black and with c.12 prominent longitudinal ridges when dry.

Distribution and ecology. E Nepal to NE India (Nagaland and Assam), possibly extending to N Myanmar. Moist or wet subtropical and lower temperate broadleaved forest; (450–)1000–2135m. Flowering April–May; fruits developing June onwards, ripe August.

Specimens examined. NEPAL. East Nepal, Arun Valley, Num, 27 $^{\circ}$ 35'N 87 $^{\circ}$ 18'E, mixed moist subtropical forest, 4500ft, 3 v 1967, *Stainton* 5915 (BM); Tamur Valley, Hellok, lower temperate broadleaved forest, 6 iv 1967, *Stainton* 5832 (BM); Chhintapu to Mamong, 27 $^{\circ}$ 07'N 87 $^{\circ}$ 56'E, 5500ft, 9 vi 1969, *Williams* 502 (BM); E of Meklajam, 27 $^{\circ}$ 51'N 87 $^{\circ}$ 34'E, 5500ft, 27 v 1969, *Williams* 211 (BM, 2 sheets).

SIKKIM. 'Sikkim', *Griffith* H.E.I.C. 6001 (K, lectotype; possibly from Bhutan, as discussed; unloc., 5000–7000ft, *J.D. Hooker & Thomson* s.n. (BM; K, p.p., with Hooker's handwriting – another K example, with printed label, is *E. psilosiphon*); 'Sikkim Mts.' [Hooker handwritten ticket], 7000ft, *J.D. Hooker* (K). North district: Talung Chhu, 5700ft, 10 v 1971, *Bowes Lyon* 6031 (BM). West district: Dentam, 1500m, 11 v 1960, *Hara et al.* 218 (*Bot. Exped. Himalaya* 1960: 2845) (BM). Mongthang plateau above Dentaon, "'Boeri', sweet white flowers", 6000ft, 5 v 1913, *Lacaita* 15382 (BM). South district: Namchee [Namchi], 4000ft, 23 iv 1876, *Clarke* 27562A (K). Temi, 4000ft, 25 viii 1876, *Clarke* 27601B (K). East district: Gangtok, Rora Chu, 27 $^{\circ}$ 20'N 88 $^{\circ}$ 38'E, forest, 5500ft, 7 iv 1966, *Stainton* 5302 (BM); Resnak [possibly Rhenok?], 4000ft, 12 v 1875, *Clarke* 27912A (K).



DARJEELING. Rimbick to Ramam, *H. Kanai et al.* 138 (*Bot. Exped. Himalaya* 1960: 2844) (K); Kurseong, 4000ft, 30 xi 1875, *Gamble* 308A (K); *ibid.*, 4500ft, 5 vi 1875, *Clarke* 26613D (BM), 26613A (K); Darjeeling terai, *Gamble* (hb. *Clarke* 28011) (BM); Kalubkoorg L., Soom, 5000ft, 1 vi 1874, *Gamble* 3365A (K); Lebnig, 5000ft, 19 v 1876, *Gamble* 648 (K).

BHUTAN. Gaylephug district: Sureylakha, dense wet evergreen forest, 3500ft, *Ludlow & Sherriff* 2934 (BM). Punakha district: 1km below Mendegang, warm broadleaved forest, 1580m, 24 iv 1982, *Grierson & Long* 4658 (E, K); near Wache, Tang Chu, 27°30'N 90°01'E, warm broadleaved forest, 1610m, 20 iv 1982, *Grierson & Long* 4539 (E, K); Tinlegang to Gon Chungang, 5 v 1967, *H. Kanai et al.* 14892 (BM, E). Tongsa district: 2km S of Shanggong [Shemgang], margins of warm mixed forest, 5 vi 1979, *Grierson & Long* 1646 (E, K); Dakpai near Shanggong [Shemgang], amongst shrubs on hot dry hillside, 1750m, 6 vi 1979, *Grierson & Long* 1685 (E, K). Mongar district: Ungar, E of Rudo La, 6500ft, 16 v 1949, *Ludlow & Sherriff* 18875 (BM). Tashigang district: near Ningala between Mongar and Tashigang, 27°18'N 91°21'E, roadside verge, 1900m, 17 vi 1979, *Grierson & Long* 2024 (E). Upper Bumthang Chu district: Tolegang, v 1840, *Griffith* H.E.I.C. 6001 labelled 'Bhutan' with Journal no. 917 (K, syntype). Upper Kuru Chu district: Dunkhar, Kur Chu Valley, Kurted, 6000ft, 8 v 1949, *Ludlow, Sherriff & Hicks* 18835 (BM).

NAGALAND. Pulebudze, Naga Hills, 6000ft, 1 iv 1935, *Bor* 4425 (K).

ASSAM. Namchung, Ludkimpore, 1500ft, 18 iv 1885, *Clarke* 37960C (BM).

MYANMAR (BURMA). Shan Hills, Kawk, 5000ft, iv 1888, *Collett* 617 (K: see note below).

Even with the separation of the Wallich material as *E. silvana* and *E. exsolata*, and the removal to the new species *E. psilosiphon* (see below) of some specimens previously confused with it, *E. wallichiana* still shows considerable variation, particularly in compactness of inflorescence, calyx and corolla size, and the density and distribution of corolla indumentum. The lectotype has compact cymes in which the corolla hairs are mainly in lines following the corolla ribs. Similar 'lined' corolla indumentum is found in the corollas of *Bowes Lyon* 6031, *J.D. Hooker* s.n. (BM), *H. Kanai et al.* 14892, *Lacaita* 15382, *Ludlow, Sherriff & Hicks* 18835 and 18875, *Stainton* 5302, etc. In others, e.g. *Bor* 4425, *Clarke* 27562 and 37960, *Gamble* 648, *Grierson & Long* 4539 and 4658, and *Stainton* 5915, the corolla tube is densely and evenly pubescent all over its exterior surface. Unsuccessful efforts have been made to establish whether this variation correlates with any other character, such as anther length or insertion. Hence, *E. wallichiana* is here not further subdivided. However, one specimen (Darjeeling district, 9 v 188x [year not stated], 5000–6000ft, "'Boeri' (P.), middle sized tree", *Lace* 2199 (E)) differs from all others seen in having completely glabrous, not densely glandular, inflorescences; the indumentum on its corollas is also sparser than usual. In all other respects, it cannot be distinguished from *E. wallichiana* and

FIG. 1. A. *Ehretia silvana* (Wallich 896, type): Aa, bud; Ab, calyx lobe; Ac, calyx; Ad, corolla; Ae, anther; Af, pistil. B. *E. wallichiana* (*Grierson & Long* 4539): Ba, bud; Bb, calyx lobe; Bc, calyx; Bd, corolla; Be, anther; Bf, pistil. C. *E. exsolata* (Wallich 896B): Ca, bud; Cb, calyx lobe; Cc, calyx; Cd, corolla; Ce, anther; Cf, pistil; Cg, dissected bud. D. *E. dolichandra*: Da, bud; Db, calyx lobe; Dc, calyx; Dd, corolla; De, anther; Df, pistil. In each quadrant, a, c, d, f \times 3.3; b, \times 13.3; e, \times 6.6; Cg, \times 3.3.

it presumably represents a sporadic mutant. By contrast, the specimen cited from the Shan Hills (Myanmar) has a very densely hairy inflorescence and is included here tentatively.

Johnston (1951: 106) commented that *E. wallichiana* was allied to *E. dunniana* Lév. and *E. longiflora* Champ. from China, as well as to *E. javanica* Blume from Java. *E. longiflora* is readily distinguished from *E. wallichiana* by its longer corollas (11–13mm) with lobes only $\frac{1}{4}$ – $\frac{1}{3}$ (not $\frac{2}{3}$) as long as the tube, longer filaments (7–11mm) and very small (0.6–0.9mm), medifixed, broadly ovoid anthers which are only $\frac{1}{2}$ – $\frac{2}{3}$ as large as those of *E. wallichiana*. The lines of yellowish-white hairs on the corolla tube in most specimens of *E. wallichiana* can just be discerned with the naked eye, whereas although *E. longiflora* has a microscopically puberulent corolla tube, the scattered hyaline hairs are so minute that they are barely visible even under a $\times 20$ dissecting microscope. The filaments of *E. longiflora* are filiform, much more slender than those of either *E. wallichiana* or *E. psilosiphon*, and inserted near the middle of the corolla tube rather than at or very near its apex. Although Johnston noted these filament characters he did not seem to appreciate their significance in delimiting *E. longiflora* from *E. wallichiana* (and its closer allies). If there is a relationship between these two species, it does not appear to be as close as Johnston believed. *E. dunniana* is very different from *E. wallichiana*, having sub-basifixed anthers, and is more closely related to *E. psilosiphon* R.R. Mill (see below).

Another species superficially similar to *E. wallichiana* is *E. confinis* I.M. Johnston. (Yunnan, N Myanmar), first described by Johnston (1951: 103) from the Shweli-Salwin divide. This species, however, has most inflorescences terminal, and much smaller, ovoid anthers c.1mm long. Dissection of the flowers reveals several fundamental differences: the corolla is 'basin-shaped' with a very widely flaring tube (a distinctive character, according to Johnston), and its short lobes are reflexed and inrolled, forming a flange around the tube; the filaments are inserted just above the base of the corolla tube, not just below its apex; and the medifixed anthers have tiny mucronate tips (in *E. wallichiana* and its allies no mucro is present). *E. confinis*, which Johnston himself considered to be a very distinct species, therefore cannot be regarded as being a close relative of the *E. wallichiana* group.

Cowan & Cowan (1929) recorded that in the districts of Darjeeling and Jalpaiguri the wood of '*E. wallichiana*' was frequently used as a source of charcoal and less often for house-building. It is not clear whether they meant *E. wallichiana* in the circumscription here adopted, or *E. psilosiphon* R.R. Mill (below) which comprises material that in the past has been treated as *E. wallichiana*, or a mixture of both species. However, since they state that '*E. wallichiana*' attains a height of 40–60ft with a clear stem of 20–30ft and a d.b.h. of 4–5ft, their material is much more likely to have been true *E. wallichiana*, which is by far the larger of the two trees.

2. *Ehretia psilosiphon* R.R. Mill, sp. nov. Fig. 2.

E. wallichianae Hook.f. & Thomson similis et hactenus saepe confusa, a qua habitu fruticoso plerumque humiliore maxime 7.5m ut videtur attingenti, foliis ad anthesin

saepe non plene expansis, nervis primariis foliorum sub angulo (28–)33–50° (non (57–)62–77(–80)°) e costa divergentibus, inflorescentia 2–4-plo dichotoma dichotomis primariis ad anthesin clare manifestis (haud floribus occultantibus), calyce fere ad basem diviso, tubo corollae extus glabro (non pubescenti), filamentis brevioribus medium loborum corollae vix excedentibus, antheris majoribus linearibus 1.8–2.2mm longis, ramulis styli sursum vix dilatatis stigmatibus distinctis convexis (haud indistinctis complanatis), floribus graveolentibus (haud suaveolentibus) differt.

Shrub or small tree 2–7.5m, deciduous. *Young branches* dark brown, older ones greyish-brown, glabrous. *Leaves* usually still expanding at start of flowering period; petiole 10–35mm; lamina elliptic or obovate-elliptic, young ones 15–70 × 10–30mm, older ones 60–160 × 35–75mm, acute to rather long-acuminate (acumen on larger leaves 5–8mm) with at least a few leaves on most branches obtuse; margin entire; base cuneate or obtuse, glabrous or minutely pubescent above and/or on veins beneath; lateral veins (5–)6–9 pairs, diverging at (28–)33–45(–50)° to midvein. *Inflorescence* lateral, usually solitary near a vegetative shoot axil, 5–8cm (incl. peduncle) × (3–)7–10cm, 2–4 times dichotomous; peduncles 1–3.5(–4)cm, glabrous or minutely glandular; first dichotomies 10–25mm, clearly visible at anthesis, glabrous or minutely glandular, second dichotomies 7–15(–30)mm, glabrous or minutely glandular. *Pedicels* 0.5–1(–3)mm, glabrous or minutely glandular. *Buds* clavate, 3.5–7mm, glabrous outside. *Flowers* 6–8mm. *Calyx* 2–3mm, deeply divided into oblong-lanceolate, obtuse or subacute lobes, usually shortly pubescent and ciliate-margined but density of indumentum rather variable. *Corolla* white, slightly but unpleasantly scented, 6–8mm; tube 5–6.5mm, longitudinally fluted, glabrous outside; lobes narrowly lanceolate, 3.5–4.5(–5) × 1.5–2mm, obtuse but usually appearing acute because of folding towards apex, strongly reflexed (and then reaching almost to base of corolla tube or projecting slightly beyond its base), often minutely puberulent on inner surface. *Stamens* exserted. *Filaments* 3.5–4.8mm, shorter than corolla lobes (scarcely exceeding their middle). *Anthers* linear, (1.5–)1.8–2.2mm, subbasifixed. *Style* exserted, 6.7–9mm, shortly to deeply bifid, style branches 1–1.5mm, little dilated upwards, stigmas distinct and ± convex. *Fruits* subglobose or broadly ellipsoid, to 6 × 5–8mm, blackish and with longitudinal ridges when dry.

Type: Bhutan, Tongsa district, Byiti Sam, Mangde Chu, clearings in rainforest, tree 25ft, perianth white, has a bad smell, 2500ft, 30 iii 1949, *F. Ludlow, G. Sherriff & J.H. Hicks* 18549 (holo. BM).

Distribution and ecology. E Nepal, India (Darjeeling), C & S Bhutan. Mixed subtropical forest; 250–1830m, but mainly below 1000m. Flowering March–April; fruits ripe by August.

Specimens examined. NEPAL. Mechi Zone, Jhapa district: Kankani River, 250m, 2 iv 1967, *D.H. Nicolson* 3101 (BM); Dharan, Dangi, 26°45'N 87°25'E, mixed moist forest, 2000ft, 13 iii 1967, *Stainton* 5707 (BM: see note below); E Nepal, Mai Khola, Soktim, 26°50'N 87°55'E, wet ravine, 1500ft, 5 iii 1969, *Stainton* 6465 (BM).

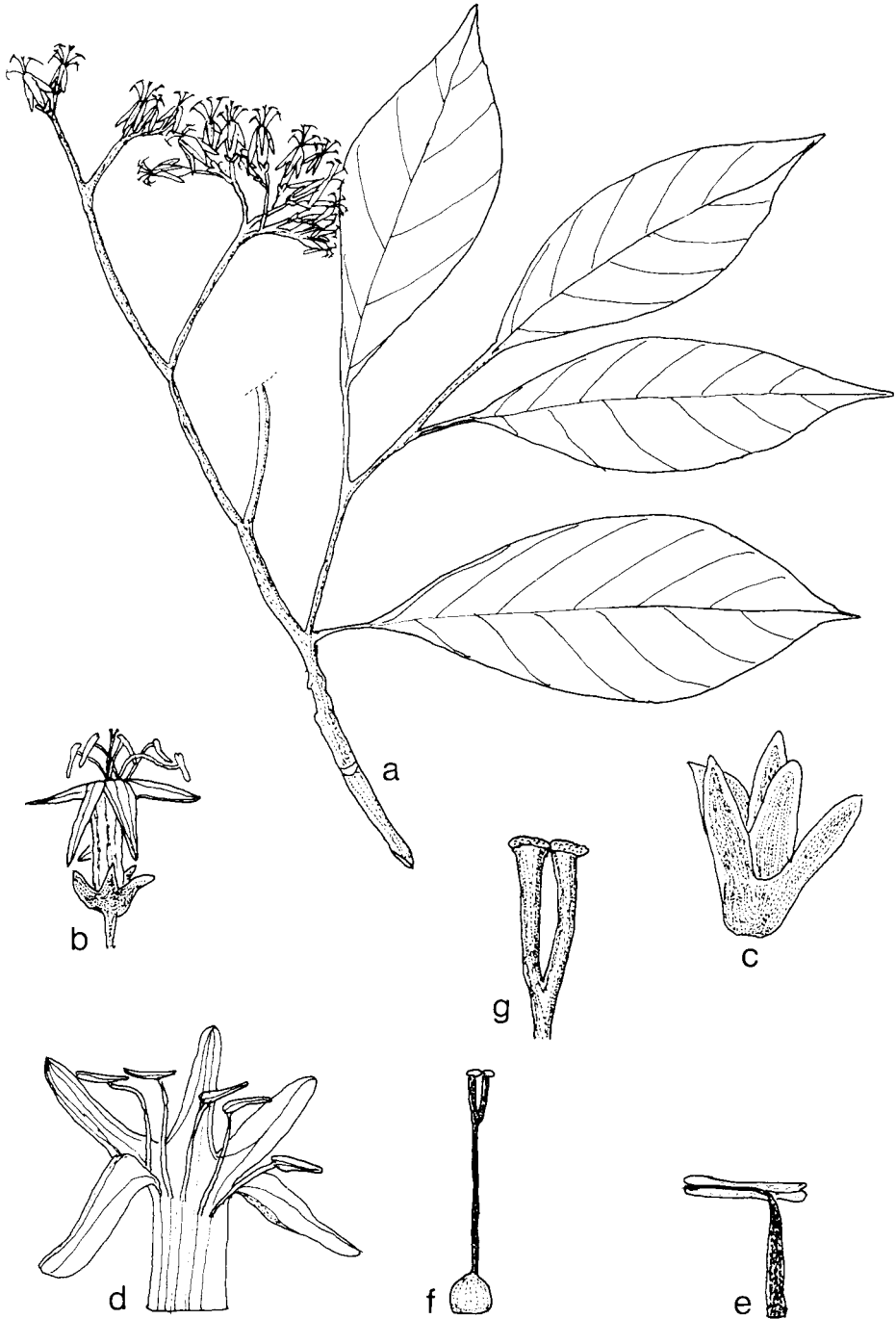


FIG. 2. *Ehretia psilosiphon* (Ludlow, Sherriff & Hicks 18549): a, flowering branch, $\times 1$; b, flower, $\times 2$; c, calyx, $\times 6.6$; d, corolla, $\times 3.3$; e, anther, $\times 6.6$; f, pistil, $\times 3.3$, g, style branches, $\times 13.3$.

DARJEELING. Below Badantaon [Badantam], 'Boeri, flowers white, sweet', c.2500ft, 9 iv 1913, *Lacaita* 15380 (BM); Rungeet, 2000ft, 10 iii 1914, *Cave* s.n. (E); Dhobi Jhora, 6000ft, viii 1880, *Gamble* 8321 (K); Rillee River, iii 1875, *Gamble* 3366A (K).

BHUTAN. Sarbhang district: near Lao Pani, 12km E of Sarbhang, 26°53'N 90°21'E, subtropical terai forest, 400m, 7 iii 1982, *Grierson & Long* 3531 (E). Gaylegphug district: Lodrai Khola near Gaylegphug, 26°54'N 90°31'E, steep valley with thinned subtropical forest, 340m, 21 iii 1982, *Grierson & Long* 3894 (E, K). Punakha district: between Wangdu Phodrang and Samtengang [probably at Kyebaka], 1400m, 10 iv 1967, *H. Hara et al.* (*3rd Exped. E. Himal.* 1967) 3692 (BM, E).

This new species is near to *E. wallichiana* but can be distinguished from it by several correlated characters as indicated in the Latin diagnosis. Of these, the differing angles of divergence of the primary leaf veins is particularly useful for foresters attempting to name non-flowering material, as the ranges found in the two species of the '*E. wallichiana* complex' occurring in Bhutan, Sikkim and Darjeeling do not overlap. The angle of divergence in *E. psilosiphon* is more akin to that found in *E. dolichandra* R.R. Mill from Arunachal Pradesh (see below). The difference in scent (unpleasant, to at least some observers, in *E. psilosiphon*; sweetly or very sweetly fragrant in *E. wallichiana*) may be an adaptation to different pollinators. This, together with *E. psilosiphon*'s slightly earlier flowering time (March–April instead of April–May), would allow the two species to grow sympatrically, as at Badantam in Darjeeling (*Lacaita* 15380 and 15382). However, more field research on variation in odour, both between the two species and to detect whether any change in odour occurs between 'male' and 'female' stages of anthesis, is necessary, as are phenological studies. *Lacaita*, on sheet 15380, noted that the flowers were 'sweet', but this is almost identical to his field note concerning *Lacaita* 15382 (*E. wallichiana*, which does have sweet-scented flowers) from the same locality (Badantaon); he may not have noticed that the plants could be referred to two different taxa and could have simply copied the same information on to both labels. If *E. psilosiphon* consistently has an unpleasant scent, as suggested by the label of *Ludlow, Sherriff & Hicks* 18549 (BM), this, together with the proximal rather than median attachment of the relatively long anthers to the filament and the similarity in leaf vein angle of divergence, would suggest that *E. psilosiphon* is more closely allied to *E. dolichandra* from Arunachal Pradesh (described below) than it is to *E. wallichiana*. *E. dolichandra* has the same combination of unpleasant smell, long anthers, lax inflorescences and proximal anther attachment as does *E. psilosiphon* but differs in having a larger, much more thickly glandular-puberulent calyx, corolla lobes puberulent within, and even longer anthers (up to 2.6mm).

E. psilosiphon is also evidently close to *E. dunniana* Lév., from China (Yunnan and Guizhou). With this species it shares the following characters which separate both of them from *E. wallichiana*: inflorescences solitary (not in groups), towards the end of a branch (not clearly lateral far from the branch apex), rather flat-topped; sub-basifixed, not medifixed, anthers: stigmatic surfaces convex (not flat). *E. psilosiphon* differs from *E. dunniana* by its ciliate but otherwise glabrous to sparsely glandu-

lar calyx lobes (rather than being very densely glandular), much less densely glandular peduncles and pedicels (sometimes \pm glabrous), and possibly also by the slightly longer anthers (at least 1.8mm); this last character is discussed in more detail below. Also, in their reflexed state the corolla lobes of *E. dunniana* reach only a little more than half-way down the corolla tube, whereas in *E. psilosiphon* the tube is relatively shorter and the lobes when reflexed project beyond its base or at least almost reach it.

Johnston (1951: 105) described the anthers of *E. dunniana* as being 0.9–1.5mm; however, in the holotype (*Cavalérie* 3479 from Guizhou: Lo-fou, E – of which Johnston saw only a photograph) most anthers are 1.7(–2)mm and so fall within the range of *E. psilosiphon*. Interestingly, the Yunnan localities cited by Johnston under *E. dunniana* (Manhao and Szemao, now Simao), which are far removed from its type locality, are in extreme SW Yunnan, whence another *Ehretia* was recently described by Liu (1984). This species, *E. pingbianensis* Y.L. Liu, was diagnosed against *E. longiflora* Champ., from which it was said to differ by its petioles, inflorescences, calyces and corollas all densely brownish-pubescent, and oblong corolla lobes. Comparison of its type description and poorly reproduced photograph with Johnston's description of *E. dunniana* reveal few significant differences. It is possible that *E. pingbianensis* is synonymous with at least part of Johnston's concept of *E. dunniana*, although the two species were kept separate by Liu (1989). (*E. dunniana* also resembles *E. dolichandra*; see discussion under that species).

E. psilosiphon seems to show relatively little variation and the anthers, which are sub-basifixed and typically 1.8–2.2mm long, characterize it well. However, in one specimen only of those examined (*Stainton* 5707, BM from E Nepal), the anthers, though sub-basifixed as is typical, are only 1.5mm long. The significance of this difference is not known; it could indicate some influence from *E. wallichiana* although in all other respects the plant resembles typical *E. psilosiphon*.

A specimen from Myanmar (Burma): Kyaukse, by canals, 400ft, i 1914, *A. English* 12 (E) very closely resembles *E. psilosiphon*, but the leaf veins diverge at about 60° , whereas all other material studied has veins diverging at $28\text{--}50^\circ$ (mostly $35\text{--}45^\circ$). It needs further study.

Another problematical specimen is *Clarke* 27631B (Sikkim: Nampok, 2000ft, 26 iv 1876). This specimen (K) was among the material of '*E. wallichiana*' studied by Clarke and was named by him as that species. It cannot, however, be accommodated within *E. wallichiana* as circumscribed here, on account of the lax, flat-topped inflorescences, leaf veins diverging at $45\text{--}50^\circ$, and glabrous corolla tubes, all characters of *E. psilosiphon*. Yet it differs from all other material of *E. psilosiphon* in its exceptionally short stigmatic branches, less than 1mm long, and in having corolla lobes which when reflexed are shorter than the corolla tube (as in *E. wallichiana*). There is only one small terminal branch on the sheet; this is not considered adequate to properly assess the status of this plant. Hence, it is for the present included with reservations within *E. psilosiphon* but has not been used in the preparation of the description. It has been separately keyed out above as '*E. sp. A*'.

3. *Ehretia dolichandra* R.R. Mill, sp. nov. Fig. 1D.

E. psilosiphoni R.R. Mill (supra) venis primariis sub angulo 30–55° e costa divergentibus, florum odore graveolenti, et antheris ad filamentas subbasifixis similis, a qua antheris etiam longioribus (2.4–2.6mm, non 1.8–2.2mm), inflorescentiis terminalibus non lateralibus, calyce majore dense glanduloso-puberulenti tubo distincto cupuliformi lobis anguste lanceolatis apicibus reflexis magis acutis, lobis corollae intus minute puberulis (haud glaberrimis) et stigmatibus planis (non convexis) recedit. Ab *E. wallichiana* inflorescentiis multo majoribus terminalibus, pedunculis longioribus, calyce duplo longiore, corolla graveolenti (haud suaveolenti) tubo extus glabro lobis obtusis, antheris multo longioribus subbasifixis (non ± medifixis) differt. Ab specie yunnanensi *E. dunniana* Lév. lobis corollae longioribus ubi reflexis basem tubi corollae ± attingentibus (non vix ultra medium excedentibus) antheris longioribus usque 2.6mm longis et stylo longiore minus profunde bifido separatur.

Small deciduous tree. *Young branches* dull yellowish-brown, old ones greyish-brown and striate, glabrous. *Leaves* still expanding at flowering time; petiole 10–16mm, puberulent; lamina rather broadly oblong-elliptic to obovate-elliptic, young ones 15–35 × 12–15mm, older ones 48–90 × 30–50mm, abruptly short-acuminate (acumen 2–4(-6)mm, rather blunt) with some leaves obtuse, entire, base obtuse to subtruncate, upper surface white-puberulent on veins and more sparsely on lamina, lower surface sparsely puberulent on veins with lamina glabrous, lateral veins 7 pairs, diverging at 35–55(–65)° to midvein. *Inflorescence* terminal, corymbose, widely convex in outline, 9–9.5 × 12–14cm, 3 times dichotomous; peduncles 3–5cm, very densely glandular-puberulent; first dichotomies 12–15mm, clearly visible; second dichotomies 6–8mm, all very densely glandular-puberulent. *Pedicels* 3–4.5mm, very densely glandular-puberulent. *Flowers* 9–11mm. *Calyx* 4–6mm, glandular-puberulent, with a distinct, short, cup-shaped tube c.1.5mm; lobes linear-lanceolate, 3.5–4.5mm, with tips recurved; margins distinctly white-hyaline. *Buds* clavate, 6.5–7mm, glabrous outside. *Corolla* white, unpleasantly scented, 6.5–7.3mm (from base to throat); tube (6–)6.5–7mm, glabrous outside; lobes narrowly lanceolate, 5.5–6.3 × 2.1–2.5mm, obtuse, becoming strongly reflexed with their tips almost reaching (but not surpassing) the base of the corolla tube, ± glabrous outside but minutely pilose on inner surface. *Stamens* exserted. *Filaments* inserted close to top of corolla tube, 5.3–6mm, rather thick but gradually tapering in distal ¼, attached to anther 0.6–0.7mm up from anther base, erect but finally with distal half ± strongly recurved. *Anthers* linear with distal end slightly arcuate, 2.25–2.6 × 0.2mm, presented vertically at anthesis with their arcuate tips facing inwards and almost touching stigmas, after anthesis becoming horizontal because of reflexion of filaments. *Style* exserted, c.9mm, bifid for 1.5–2mm of which 1–1.5mm is style branches and the remainder the stigmas; style branches gradually dilated upwards, stigmatic surfaces flat, c.0.8mm across, truncate in side view, whitish and so strongly contrasting with the dark brownish style. *Fruits* unknown.

Type: India (Arunachal Pradesh), 'Assam', Delei valley, 28°5'N 96°30'E, 'a small

tree with flopping branches, found in thickets along the more or less open river bank, deciduous; flowers white, rather unpleasantly scented but attractive to butterflies, appearing with the leaves, or before them; the formula is $K_5 C_{(5)} A_5 G_{(2)}$, stigma bifid, which answers to *Viburnum*, except that the leaves are alternate!'. 2000ft, 21 iii 1928, *F. Kingdon Ward 7986* (holo. and iso. K – the isotype is merely labelled '*Ehretia wallichiana* Hook.f. Coll. *F. Kingdon Ward 7986 Delei Valley 21.iii.1928 Assam*' and has less well-developed corymbs).

Distribution and ecology. NE India (Arunachal Pradesh). Thickets along river bank; c.600m. Flowering in March. Known only from the type gathering. This Kingdon-Ward collection is from the Lohit district of Arunachal Pradesh, which has yielded many interesting new species, including the relict taxad, *Amentotaxus assamica* D.K. Ferguson (Ferguson, 1985), which was collected little more than a fortnight later than *E. dolichandra*, also in the Delei valley.

E. dolichandra is very distinctive on account of its extremely long anthers, to which the specific epithet alludes (Greek: *dolichos*, long; *andros*, male). These are even longer than those of *E. psilosiphon* and appear to be the longest anthers of all the Sino-Himalayan species of *Ehretia*.

Both *E. dolichandra* and *E. psilosiphon* differ from *E. wallichiana* by their more acutely diverging primary veins, and from the little available information both have unpleasantly scented, instead of sweetly perfumed, flowers. *E. dolichandra* appears to be most closely allied to *E. psilosiphon*, and especially to *E. dunniana* (Yunnan). However, *E. dolichandra* differs from *E. psilosiphon* not only in anther length but also in the larger, terminal inflorescence, the larger calyx which has a distinct tube and very much longer lobes and is densely glandular-puberulent, the obtuse (not acute) corolla lobes which are minutely pubescent on their inner surface, and the more or less flat (not markedly convex) stigmatic surfaces.

E. dolichandra shares characters with *E. dunniana* that *E. psilosiphon* lacks, such as the exceedingly densely glandular calyces and inflorescence branches. However, in *E. dunniana* the corolla lobes when reflexed reach only to about the middle of the tube, whereas in *E. dolichandra* they extend almost to (but do not surpass) its base. The anthers of *E. dolichandra* (2.4–2.6mm) are longer than in *E. dunniana* (less than 2.2mm), while the longer style is relatively less deeply bifid.

4. *Ehretia silvana* R.R. Mill, **nom. nov.** Fig. 1A.

Syn.: *Cordia acuminata* Wall. in Roxb., *Fl. Ind.* ed. Carey & Wall. 2: 339 (1824) non *Ehretia acuminata* R. Br., *Prodr.* 497 (1810). Lectotype (designated here): [Bangladesh] Silhet, 1821, *Wallich* 896 (lecto. K-Wallich, bottom left-hand specimen; isolecto. BM, K [2 sheets]) – 'A native of Silhet, where it was found in flower by Mr De Silva in February'. Wallich's description of *C. acuminata* validates the *nomen novum*.

E. wallichiana sensu C.B. Clarke in Hook.f., *Fl. Brit. India* 4: 143 (1883) p.p., non Hook.f. & Thomson in Gamble, *List Trees Darjeeling* 57 (1878).

Tree; branches terete, glabrous, young twigs dark reddish-brown, older ones with smooth, grey bark; leaf scars on young twigs conspicuously paler than twigs, cordate or shield-shaped. *Leaves* expanding mainly after the flowers; petiole 10–22mm, channelled on one side; lamina coriaceous, elliptic, those seen up to 150–160 × 75mm (but only 30–40 × 11–30mm on the K-W lectotype), shortly acuminate, base cuneate to shortly attenuate; upper surface of young leaves sparsely and minutely puberulous, lower surface ± glabrous; older leaves ± glabrous beneath except for a very few antrorsely appressed submarginal setules; margin very shallowly and remotely crenulate; veins 6–7 per side, rather prominent beneath, diverging from midrib at (48–)55–65°. *Inflorescences* terminal and sublateral, corymbose; corymbs ovoid, fairly open but not as much as those of *E. psilosiphon* and *E. exsoluta* (below), ± flat-topped, 25–50 × 30–70mm, twice or three times dichotomous, shortly pedunculate; peduncles 10–25mm, first and second dichotomies 3–6mm, pedicels 0.5–1.5mm, all minutely but very densely glandular-puberulent. *Bracts* usually minute (occasionally to 12mm), at base of peduncle, linear. *Buds* 4–7mm, clavate, glabrous. *Calyx tube* short (0.5–0.8mm), shallowly cup-shaped, sparsely glandular-puberulent; *calyx lobes* at first erect but finally spreading, lanceolate, 1.0–1.2 × c.0.3–0.5mm, acute, sparsely glandular-puberulent near their base and eglandular-ciliate-margined. *Corolla* white (*vide* Wallich: buds drying uniformly dark blackish-pink, corollas pinkish-brown), infundibular, 9–10mm; tube cylindrical, (4.5–)5–6mm, straight, somewhat longitudinally fluted, rather suddenly expanded at throat, exceedingly sparsely and minutely pilosulous on veins but otherwise glabrous; lobes erecto-patent at anthesis but at length reflexed, elliptic, 3–4 × 2.2–2.7mm. *Filaments* inserted near top of tube (c.5mm up from corolla base), c.3.2mm, attached to the anther about 0.5–0.7mm (c. 1/3 way up) from base of anther; *anthers* presented vertically at anthesis, exerted from throat but not from corolla, linear-sigmoid, c.2mm (usually shrinking and 1.7–2.1mm when dry). *Style* c.7.5mm (shrinking to c.6mm), unequally bifid (style branches c.2 and 1.5mm (shrinking respectively to c.1.5 and 1mm), the longer one c. 1/4 × style length), about equalling filaments but slightly shorter than anthers; stigmatic surfaces concave, with crenulate, undulate margins. *Fruit* unknown.

Distribution. Assam, Bangladesh. Flowering in February; no other ecological information available.

Specimens examined. ASSAM. Khasia, *Griffith* 182 (fragment with printed annotation Lemann, 1844) (K, mounted on same sheet as one of the isolectotypes; other sheets without indicated annotation, K and K-W).

BANGLADESH. Silhet, *Wallich* 896 (isolectotypes: BM, K).

The number and year on the *Griffith* sheets cited do not tally with Griffith's itineraries. The sheet on which the main specimen of this number is preserved is labelled '182 Khasya Griffith' in ink, with a pencil determination on the same label: *Premna integrifolia* Wall. *Cat. 1766 or scandens?* These names do not agree with any of Griffith's Khasia numbers. He was in Khasia between 1837 and 1838, not 1844, and

no. 182 of his Khasia sequence is not an *Ehretia*, but a *Scrophularia*. Presumably the material was collected by Charles Morgan Lemann (1806–1852) and gifted to Griffith, either directly or through the East India Company.

No recent collections of *E. silvana* have been seen; it remains known only from the type and the Assam specimen cited. More material, especially fruiting, is desirable to complete the description.

5. *Ehretia exsoluta* R.R. Mill, sp. nov. Fig. 1C.

Syn.: *Cordia acuminata* auct. non Wall. in Roxb., Fl. Ind. ed. Carey & Wall. 2: 339 (1824) nec Wall. in sched. Wall. 896 B.

Ab *E. silvana* R.R. Mill (*Cordia acuminata* Wall. vero) calycibus fere usque ad basin quinquelobatis, corollis multo minoribus breviter campanulatis tubo in sicco lobis clarissime pallidioribus, ramificationibus inflorescentiae et pedicellis haud glanduloso-puberulentis, lamina foliorum obtusis (haud breviter acuminatis) venis primariis sub angulo plerumque paulo acutiore (35–55° non 48–65°) e costa divergentibus, lobis corollae mox valde reflexis (non suberectis interdum tarde reflexis), antheris brevioribus 0.9–1.1mm ± medifixis recedit. Ab *E. psilosiphone* R.R. Mill (supra, cum *E. wallichiana* adhuc confusa) foliis obtusis subacutisve (non usque acuminatis), lobis calycis brevioribus (0.9–1.2mm) sed profundioribus fere ad basin calycis attingentibus, antheris subduplo brevioribus (0.9–1.1mm, non 1.8–2.2mm), stylo brevissime bifido differt. Ab *E. wallichiana* Hook.f. & Thomson vero pedunculis ramificationibusque inflorescentiae eglanduloso-pubescentibus (haud glandulis), calyce breviori profunde lobato, corolla subcampanulata breviori tubo extus glabro (haud dense puberulenti) lobis obtusis minutissime ciliatis, stylo brevissime (haud profunde) bifido insignis.

Tree; branches pale greyish, striate, glabrous; leaf scars on young twigs inconspicuous (almost same colour as twig), transversely elliptic or semicircular. *Leaves* expanding mainly after the flowers; petiole 15–20mm; lamina coriaceous, elliptic or ovate-elliptic, 30–90 × 20–65mm, obtuse or subacute (never acuminate, in material seen), base obtuse or cuneate; upper surface puberulent on veins, lower surface subglabrous; margin remotely and minutely denticulate and remotely, minutely scabrid; primary veins c.(4–)5 per side, diverging from midrib at (35°)40–55°. *Inflorescences* lateral, also subterminal, corymbose; corymbs 30–60 (usually c.60) × 40–80mm, rather lax and flat-topped, two or three times dichotomous, shortly pedunculate; peduncles 12–25mm, first dichotomies 6–14mm, second dichotomies 9–14mm, pedicels 3–5mm, the peduncles and primary dichotomies sparsely eglandular-pubescent, the ultimate dichotomies and pedicels more densely so. *Bracts* absent. *Buds* obovoid, 2.5–3.5mm, glabrous, the corolla lobes slightly cucullate at tip. *Calyx* divided almost to base, lobes lanceolate, 0.9–1.2 × 0.3–0.5mm, ± glabrous dorsally but with dense, rather long white hairs on margin. *Corolla* white, shortly campanulate, 4.5–5.5mm, c.6mm diam.; tube 2.5–2.7mm, whitish when dry and strongly contrasting with lobes, glabrous; lobes pinkish-brown when dry, ovate-lanceolate, c.2.5 × 1.25mm, obtuse.

minutely ciliate-margined, soon becoming strongly reflexed and then reaching almost to base of corolla tube. *Filaments* 1.5–2mm (but very short in bud, only c.0.4mm), their apices about level with style apex at start of anthesis but lengthening after anthesis and overtopping the style but at the same time becoming reflexed over the corolla lobes. *Anthers* 0.9–1.1mm (even in bud), oblong-ovoid, \pm medifixed but erect in bud. *Style* with a constriction immediately above ovary, exserted, c.5mm, equally but very shortly bifid for c.0.5mm (c. $\frac{1}{10}$ of style length); stigmatic surfaces flat and appearing truncate in lateral view. *Fruit* unknown.

Type: Material cultivated at Calcutta Botanic Garden, *Wallich* 896 B (holo. K-W; iso. E, E-GL, BM, K; some sheets being numbered 896, as indicated in the discussion of the lectotypification of *Cordia acuminata*).

The shortly campanulate corollas, which dry with a whitish tube and contrasting pinkish-brown lobes, clearly separate this species from the members of the *E. wallichiana* group, all of which have infundibular corollas. The way the corolla dries, which seems very characteristic, is reminiscent of *E. abyssinica* R. Br. from Ethiopia, Yemen and Saudi Arabia, but that species has much larger, very densely glandular inflorescences, and larger corollas 9–10mm diam. The deeply lobed calyx also separates *E. exsoluta* from all the members of the *E. wallichiana* group, whose calyces have a distinct, cup-shaped united portion almost equalling the lobes; in *E. exsoluta*, this is reduced to a very shallow bowl. No known Indian species exactly matches *E. exsoluta*; since it has not been possible to match it with any other species from elsewhere in the world which might have been the source of the material introduced to Calcutta Botanic Garden, it is here described as a new species. The possibility cannot however be discounted that it is some exotic species not represented in any of the herbaria that have been searched. Its true identity therefore remains somewhat enigmatic.

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