

The genus *Habenaria* (Orchidaceae) in Myanmar

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ABSTRACT

A review of the genus *Habenaria* in Myanmar is presented. Fifty species are recognised, with 11 of them endemic to the country. Only 24 species are well-documented in Myanmar, being known from several to many collections, while the remaining 26 species are currently only known from one or two collections. An identification key to the species is provided. Accepted names and their place of publication, synonyms, citations in relevant floristic literature and type specimens are given in all taxa. We also provide short descriptions, a list of examined specimens from Myanmar, as well as notes on distribution, habitat ecology and flowering time. Colour photographs and black-and-white sketches of a number of species are also included.

KEYWORDS: *Habenaria*, Myanmar, identification key, review, typification.

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INTRODUCTION

Myanmar's flora is very diverse due to the size of the country and the abundance of different habitat types, ranging from tropical lowland rainforest in the south to montane forest and subalpine grassland in the northern parts. But at the same time the flora is very poorly known, necessitating much basic floristic inventory work. Also the orchid family is well represented in Myanmar, with 1,037 species in 152 genera listed in a recent checklist (Ormerod *et al.*, 2021).

The pantropical genus *Habenaria* Willd. is the largest genus of the orchid subfamily Orchidoideae, accounting for nearly 900 species worldwide (Govaerts *et al.*, 2022; classification after Chase *et al.*, 2015). The large number of species has often deterred potential students from undertaking taxonomic and phylogenetic research in this genus. Although several detailed studies on the basis of morphological and molecular work are already available (e.g., Jin *et al.*, 2014, 2017; Ngugi *et al.*, 2020; Pandey & Jin, 2021a), there is as yet no phylogeny for the entire genus that is based on a

large sample size. However, further research is currently underway.

In Myanmar, the genus *Habenaria* is represented by 50 species which are found in forested habitats, savanna and grassland in all parts of the country. Twenty-four species are known to us from several to many collections. The remaining 26 are only known from one or two collections at present, which points to the need for extensive collecting work. Much research on the species of this genus is still needed in Myanmar. In order to disentangle poorly understood species groups and to define their species delimitations, much revisionary work in the wider mainland Asian region is also needed. Among the groups represented in Myanmar this applies particularly to the *H. digitata* Lindl., *H. pectinata* D.Don and *H. diphylla* Dalzell groups. Two of the endemic species are suspected of having been placed in the wrong genus, namely *H. spatulifolia* C.S.P.Parish & Rehb.f. (with striking similarities to *Diplomeris* D.Don) and *H. prazeri* King & Pantl. (similarities to *Platanthera* Rich.), and it is hoped that future research will clarify the situation and

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assign them to the correct generic placement. Two endemic *Habenaria* species, *H. longibracteata* (Lindl.) Hook.f. and *H. yomensis* Gage, are known from incomplete and badly insect-damaged old herbarium specimens and brief protologues that lack detail. They are listed here as ‘insufficiently known’, and we suggest that re-collection is needed for a thorough examination.

Phytogeographical affinities of the *Habenaria* species in Myanmar exist mainly with India (particularly north-eastern India), the Himalayas, Thailand, Indochina and south-western China. Only few species are shared with Malesia, namely *H. reflexa* Blume, *H. reniformis* (D.Don) Hook.f., *H. dentata* (Sw.) Schltr., *H. stenopetala* Lindl. and *H. acutifera* Wall. ex Lindl.; most of these only with an isolated occurrence in specific parts of Malesia. Eleven species are currently considered as endemic to Myanmar, which is among the highest numbers of endemics in the orchids of the country, second only to *Dendrobium* Sw. (13). Seven of the endemics are only known from the type collection.

A Flora of Myanmar Project was recently initiated by the Myanmar Forest Department in collaboration with the National Museum of Nature and Science (Japan) to address the poor level of understanding of the country’s flora, and is aimed at a comprehensive study of all flowering plants in the country. It is widely agreed that an extensive specimen-collecting programme will need to be undertaken before the actual flora-writing work can start. A published Flora treatment is therefore still several years or decades away, and it is assumed that the virus pandemic and the political situation in Myanmar probably have caused further delays. In the meantime, we here present a review of the *Habenaria* species currently known in the country.

MATERIAL AND METHODS

The present review is based on herbarium and literature study as well as fieldwork in various parts of Myanmar since the early 1990s. All of the herbarium and spirit materials from Myanmar in the herbaria AMES, BM, CAL, E, K, MBK, NY, RAF, TNS, SING and W have been examined during personal visits or in herbarium loans; [s] denotes material preserved in spirit. The species are arranged according to their presumed phylogenetic relationships, although this has proved difficult in some taxa. In particular,

we have experienced problems in our treatment of the *Habenaria digitata* species complex, the *H. pectinata* and the *H. diphylla* groups (the first and the last only poorly represented in Myanmar), and we hope that a comprehensive future study based on morphological and molecular evidence will come up with a more satisfactory treatment. Specimens were identified using relevant floristic literature of nearby countries (mostly Pearce & Cribb, 2002; Chen & Cribb, 2009; Kurzweil, 2009, 2011; Raskoti, 2009; Averyanov, 2010), the protologues of the species and images of the type specimens. Unless otherwise stated, the specimens from Myanmar have been examined and identified by the first two authors of the present paper and by Santi Wathana. Because the genus *Habenaria* is poorly known in Myanmar, several specimens could not be identified with certainty. In a few species we had to use ‘cf.’ and ‘aff.’ to indicate such doubt. Exceptions are the specimens deposited in the Central National Herbarium of the Botanical Survey of India (CAL) where we have trusted the present identifications, mostly done by G. King and R. Pantling, and later by succeeding botanists of both Indian and foreign origin. The citation of type specimens is based on our own herbarium studies, on JSTOR as well as the protologues, Kurzweil (2009), Pearce & Cribb (2002), Kumar *et al.* (2018), Ormerod *et al.* (2021) and Pandey & Jin (2021a). Four lectotypifications are proposed in the present paper. Barcode numbers of type specimens are written between square brackets following the herbarium acronym. Accession numbers are used if barcodes are not available and are abbreviated as “acc. no.”. An exclamation mark “!” after the herbarium acronym or the barcode/accession number indicates that either the actual sheet or a digital image have been seen by one of the authors. Relevant synonyms based on types from surrounding countries are also given.

Short descriptions are provided and are based on the floristic literature of nearby countries and our own measurements taken in specimens from Myanmar and Thailand. In the section on the specimens from Myanmar, the cited specimens have been seen by one of the authors. Detailed locality information is not given for conservation reasons, in order not to reveal information that could be used in illegal collecting activities. Information on collecting date, habitat and elevation was extracted from the herbarium labels. Unfortunately, information is often

scanty or absent, especially in older specimens. For this reason we also provide information on habitat, elevation and flowering time from flora treatments in nearby countries in mainland Asia where the flora is much better known and a much larger number of collections is available, especially where there are no data at all from Myanmar. Due to the low number of available specimens as a result of insufficient collecting work, an assessment of a species' conservation status is not possible and has therefore not been attempted.

A note on illustrations: As Myanmar is wedged between India and Thailand there are understandably many common species of *Habenaria* that were well illustrated by the orchid workers of the two respective countries. Especially Seidenfaden's studies on Thai orchids have been both very inspiring and comprehensive. In the present paper selected species are illustrated by colour photographs, almost all of them taken within Myanmar. In addition, black and white sketches are here provided in the endemic species, for which illustrations are not readily available in the literature as yet. Though we soaked the left-over flowers in ammonia and tried to understand the features that make them unique we are far from satisfactory and most are irrecoverably lost for a closer study. Only in a few of these endemic species the floral segments are illustrated in the present paper, as they could be prepared from drawings on the herbarium sheet of the type specimen. We provide the illustrations of the endemics with the hope of instilling interest in the native botanists to undertake fieldwork to locate the species so that floral features could be studied afresh and brought to the notice of all. This will help us assess the uniqueness of the species and evaluate their current status, and will ultimately help understand the phylogeny of the genus at large.

TAXONOMIC TREATMENT

HABENARIA

- Willd., Sp. Pl. ed. 4: 44. 1805; Parish in Mason, Burma – People and Productions, vol. II (Botany): 185. 1883; Hooker, Fl. Brit. India 6: 131. 1890; Grant, Orchids Burma: 330. 1895; Holttum, Orch. Malaya: 79. 1953; Seidenfaden & Smitinand, Orch. Thailand I: 21. 1959; Seidenfaden, Dansk Bot. Ark. 31(3): 65. 1977; Comber, Orch. Java: 60. 1990; Seidenfaden, Opera Bot. 114: 54. 1992; Seidenfaden & Wood, Orch. Penins. Malaysia Singapore: 109. 1992; Comber, Orch. Sumatra: 100. 2001; Pearce & Cribb, Orch. Bhutan: 146. 2002; Pridgeon *et al.*, Gen. Orchid. 2: 298. 2001; Chen & Cribb in Chen *et al.*, Fl. China 25: 144. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 7. 2009; Barretto *et al.*, Wild Orch. Hong Kong: 240. 2011; Kurzweil in Fl. Thailand 12(1): 79. 2011. Lectotype, designated by Kränzlin, 1892: *Habenaria macroceratitis* Willd.
- *Aopla* Lindl., Edwards's Bot. Reg. 20: t. 170. 1834. Type: *Aopla reniformis* (D. Don) Lindl. (= *Habenaria reniformis* (D. Don) Hook. f.).
- *Centrochilus* Schauer, Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19(Suppl. 1): 435. 1843. Type: *Centrochilus gracilis* Schauer (= *Habenaria linguella* Lindl.).
- *Habenella* Small, Fl. S.E. U.S.: 316. 1903. Type: *Habenella garberi* (Porter) Small (= *Habenaria garberi* Porter).
- *Kryptostoma* (Summerh.) Geerinck, Bull. Jard. Bot. Natl. Belg. 52: 149. 1982. — *Habenaria* Willd. sect. *Kryptostoma* Summerh., Kew Bull. 14: 135. 1960. Type: *Kryptostoma tentaculigerum* (Rchb. f.) Geerinck (= *Habenaria tentaculigera* Rchb. f.).
- *Fimbrorchis* Szlach., Orchidee (Hamburg) 55: 489. 2004. Type: *Fimbrorchis trichosantha* (Wall. ex Lindl.) Szlach. (= *Habenaria trichosantha* Lindl.).
- *Kraenzlinorchis* Szlach., Orchidee (Hamburg) 55: 57. 2004. Type: *Kraenzlinorchis mandersii* (Collett & Hemsl.) Szlach. (= *Habenaria mandersii* Collett & Hemsl.).
- *Ochyrorchis* Szlach., Richardiana 4: 52. 2004. Type: *Ochyrorchis multipartita* (Blume ex Kraenzl.) Szlach. (= *Habenaria multipartita* Blume ex Kraenzl.).
- *Plantaginorchis* Szlach., Richardiana 4: 61. 2004. Type: *Plantaginorchis plantaginea* (Lindl.) Szlach. (= *Habenaria plantaginea* Lindl.).
- *Platantheroides* Szlach., Richardiana 4: 103. 2004. Type: *Platantheroides obtusa* (Lindl.) Szlach. (= *Habenaria obtusa* Lindl.).
- *Odisha* S. Misra, Orchids India: 251. 2007. Type: *Odisha cleistantha* S. Misra (= *Habenaria dentata* (Sw.) Schltr.).

Herbs, usually terrestrial, rarely lithophytic, very rarely epiphytic; above-ground parts deciduous, plants most often glabrous. *Underground root tubers* one or two, globose, ellipsoid or oblong, unlobed, with a tuft of roots above the tuber(s). *Stems* erect, (5–)10–80(–150) cm tall, unbranched, base with cataphylls. *Leaves* (1–)2 to several, basal/radical or cauline and scattered along the stem or clustered in the middle, lower or upper stem part, narrowly lanceolate to elliptic-lanceolate or ovate, rarely cordate or reniform, mostly acute, base sheathing, petiolate, cuneate or amplexicaul. *Inflorescences* terminal, racemose; peduncle mostly with erect or less often spreading sterile bracts; rachis lax, semi-dense or dense, few- to many-flowered, rarely one-flowered; floral bracts lanceolate or ovate, mostly acute, shorter or longer than pedicel plus ovary. *Flowers* normally resupinate in Myanmar species, small, medium-sized or rarely large, often fragrant; dominating colours are green, yellow and white; blue flower colour was reported in *Habenaria masoniana* King & Pantl. but this would need to be verified. *Ovary* mostly indistinguishable from pedicel,

glabrous or not. *Sepals* free, median sepal concave or galeate, often forming a hood together with the petals; lateral sepals oblique or not, spreading. *Petals* entire or less often bilobed. *Lip* 3-lobed or rarely entire, almost always spurred, spur short or elongate, clavate or cylindric; lip side lobes entire or sometimes lacinate or deeply fimbriate. *Column* short, without undifferentiated column-part; anther erect or more or less reflexed, connective between the thecae narrow or wide, anther canals often prominent and elongate, sometimes short and insignificant; pollinia 2, sectile, narrowly ellipsoid, caudicle linear; auricles small and inconspicuous or sometimes prominent; stigmas two, usually freely projecting, separate, more or less clavate; rostellum 3-lobed, lateral arms attached to the anther canals, central lobe an insignificant bulge between the anther thecae or very rarely prominent. *Fruit* a dry capsule, dehiscing along six longitudinal slits.

A genus of ca 890 species with a pantropical distribution; mostly found in grassland, savanna and forest. Fifty species in Myanmar, with 11 of them endemic.

KEY TO THE SPECIES OF *HABENARIA* IN MYANMAR

(adapted from the key in Seidenfaden, 1977)

Habenaria longibracteata is not included in the key as no mature flowers have been seen.

1. Petals two-lobed; leaves cauline, either scattered along the stem or clustered in the stem middle, or in the lower or upper stem part
 2. Sepals aristate or drawn out into long caudate threads
 3. Sepals aristate or caudate; anterior petal lobe strongly reduced and tooth-like, 1.5–3 mm long **1. *H. stenopetala***
 3. Sepals long acuminate-caudate; petals with both lobes filiform, 15–20 mm long **2. *H. pantlingiana***
 2. Sepals not aristate or caudate
 4. Distinction between ovary and pedicel very pronounced; inflorescences dense or semi-dense; flowers usually green, greenish-brown or reddish-green **3. *H. corymbosa***
 4. No sharp distinction between ovary and pedicel; inflorescences lax; flowers mostly green, green and white, entirely white, greenish-white or greenish-yellow (*Habenaria digitata* complex)
 5. Plants slender, mostly 19–30 cm tall, drying yellowish-brown; lip lobes filiform, more or less equally long, 9–12 × 0.5–0.75 mm; anther canals ca 2.5 mm long **5. *H. amplexicaulis***
 5. Plants robust, mostly taller than this, around 30–57 cm, mostly drying light to dark brown; lip lobes narrowly oblong or linear, subequal in length or side lobes shorter than the midlobe; anther canals to 1.5 mm long
 6. Leaves to 12, scattered along the stem; flowers greenish-white, 1–2 cm across, emitting a strong foul odour; posterior petal lobe longer than the anterior one; lip midlobe pendulous, side lobes shorter and recurved; spur shorter than or as long as pedicel plus ovary; stigmas short, to 1.5 mm long **6. *H. cf. gibsonii* var. *foetida***
 6. Leaves mostly 5–7, usually clustered in the middle of the stem; flowers green, greenish-yellow or whitish-green, smaller than this; anterior petal lobe usually slightly longer than the posterior lobe; lip lobes subequal in length; spur slightly shorter than pedicel plus ovary; stigmas longer than this **4. *H. digitata***
 1. Petals almost always unlobed; leaves cauline or basal
 7. Lip side lobes deeply lacinate
 8. Median sepal 6–8.5 mm long; petals linear-lanceolate, 0.5–1 mm wide; lip side lobes divided into 15–30 unbranched laciniae; spur 25–40 mm long, mostly longer than pedicel plus ovary **7. *H. myriotricha***
 8. Characters not as above
 9. Median sepal 10–15 mm long; petals linear-falcate, 1.3–1.5 mm wide, glabrous; plants turning light brown or medium-brown when dried **8. *H. trichosantha***

9. Median sepal mostly 14–22 mm long; petals various, 3–11 mm wide, hairy or not; plants turning dark brown or black when dried
10. Ovary 3-angled; auricles of the column prominent, linear, to 2 mm tall **9. *H. triquetra***
10. Ovary terete; auricles mostly inconspicuous
11. Petals obliquely subovate-falcate, 8–11 mm wide
12. Anther connective wider than 8 mm; spur 13–25 mm long, shorter than pedicel plus ovary **10. *H. yuana***
12. Anther connective 2–5 mm wide; spur 20–85 mm long
13. Spur mostly 70–85 mm long, much longer than pedicel plus ovary; connective 2–5 mm wide; inflorescence mostly with 3–7 flowers **11. *H. intermedia***
13. Spur 20–40 mm long, nearly as long as to slightly longer than pedicel plus ovary; connective 3–4 mm wide; inflorescence 5- or more-flowered **12. *H. arietina***
11. Petals falcately oblong, 3–7 mm wide
14. Connective 10–12 mm wide **13. *H. cf. limprichtii***
14. Connective ca 2 mm wide **14. *H. pectinata***
7. Lip side lobes present or rarely absent; if present not lacinate, though sometimes dentate at the margin
15. Lateral sepals strongly oblique, their front margin broadly rounded; lip without transversal ridge in front of the spur entrance
16. Lateral sepals with the front margin pointing downwards to form a false apex, with the true apex close behind the point of insertion of the lateral sepal; median sepal much shorter than the lateral sepals
17. Spur 50–80 mm long **15. *H. commelinifolia***
17. Spur under 20 mm long
18. Anther canals 10–12 mm long; spur 6–7 mm long **16. *H. longitheca***
18. Anther canals 5–8 mm long; spur 15–18 mm long, forwards-curved **17. *H. reflexa***
16. Lateral sepals strongly oblique and their front margin broadly rounded, but not with a false apex formed by the anterior margin of the lateral sepals; median sepal not much shorter than the lateral sepals
19. Inflorescences with many flowers; robust herbs 30–90 cm tall; median sepal 6–7 mm long; spur 10–20 mm long **18. *H. malleifera***
19. Inflorescences 1- or 2-flowered; slender herbs about 16 cm tall; median sepal about 12.7 mm long; spur ca 35 mm long **19. *H. spatulifolia***
15. Lateral sepals not strongly oblique, if somewhat oblique then with a transversal ridge or collar in front of the spur entrance
20. Plants mostly robust; leaves 2 to several, cauline or less often basal, if basal then spreading or suberect, but not flat on the ground
21. Lip 3-lobed
22. Lip 3-lobing very shallow; side lobes very indistinct **38. *H. prazeri pro parte***
22. Lip 3-lobing pronounced
23. Flowers rather large, white, inflorescences 10- to many-flowered; leaves 2–7, cauline, 5–20 × 1–4.5 cm; median sepal 7–17 × 4–9 mm, lateral sepals mostly 7.5–18 × 3.4–5.5 mm; lip spur up to 50 mm long and usually geniculate, in peloric forms short or absent altogether; anther canals 1–3 mm long, stigmas 2.3–3 mm long **20. *H. dentata pro parte***
23. Not the above combination of characters; floral parts mostly smaller
24. Lip midlobe curved upwards and adnate to the hood made up by the median sepal and the petals
25. Spur strongly clavate, 3–6 mm long, shorter than pedicel plus ovary **21. *H. shweliensis***
25. Spur slender cylindric, 16–25 mm long, longer than pedicel plus ovary **22. *H. lucida***
24. Lip midlobe not upcurved and adnate to the hood
26. Anther canals (1–)2–5 mm long, distinctly narrowed from the much thicker loculi, either straight and projecting forwards or curved upwards
27. Lip side lobes subulate, shorter than the midlobe
28. No collar-like structure on the lip in front of the spur entrance; lateral sepals spreading, oblong-ovate, not oblique; spur cylindric and clavate in its distal part, 8–10.8 mm long **23. *H. chlorina***
28. Lip with a collar-like structure in front of the spur entrance; lateral sepals oblique, recurved; spur mostly longer than this
29. Spur 7–19 mm long, slightly shorter than pedicel plus ovary **24. *H. acuifera***
29. Spur 20–29 mm long, much longer than pedicel plus ovary **25. *H. linguella***
27. Lip midlobe and side lobes equally long or side lobes longer
30. Spur slightly shorter than pedicel plus ovary; anther canals 2–3 mm long and slightly curved upwards; auricles prominent and nearly as high as the anther; flowers mostly pink, orange-brown, brown or red-orange **26. *H. rostrata***
30. Spur longer than pedicel plus ovary; anther canals various; auricles not like this; flowers white, whitish-yellow or yellow-green
31. Leaves 2–6, cauline, clustered in the lower part of the stem, mostly more than 2 cm wide
32. Petals broadly ovate, 4–6 mm wide; spur 20–30 mm long; anther canals about 2 mm long; plants usually lithophytic **27. *H. vidua***
32. Petals linear-oblong, ca 1.5 mm wide; spur 30–35 mm long; anther canals about 1 mm long; both collections of this species known so far were epiphytic **28. *H. corticicola***

31. Leaves 4–13, radical, suberect or spreading, in a cluster at the base of the stem, 0.5–1.5 cm wide
 33. Median sepal ovate, lateral sepals ovate-lanceolate; petals ovate-ligulate, falcate, ca 4.5×1.2 mm; lip side lobes narrower than the midlobe, ca 14 mm long **29. H. plurifoliata**
 33. Median sepal elliptic, lateral sepals obliquely elliptic; petals narrowly oblong or linear, slightly oblique, 4–5 \times 1–1.2 mm; lip lobes all equally wide, side lobes to 11 mm long **30. H. tonkinensis**
26. Anther canals short, under 1 mm long (mostly 0.2–0.5 mm long) or not differentiated from the loculi at all
 34. Inflorescences lax
 35. Leaves basal, spreading or suberect, 0.4–0.85 cm wide
 36. Floral bracts shorter than pedicel plus ovary; flowers very small, median sepal 2–3.5 mm long; petals triangular-ovate, 2–3.8 \times 0.5–1.5 mm; lip lobes oblong or narrowly oblong, midlobe 3–5 mm long, side lobes 3–6 mm long, as long as midlobe or longer; spur slender cylindric, to 21 mm long **31. H. cf. viridiflora**
 36. Floral bracts as long as pedicel plus ovary, slightly shorter or slightly longer; flowers small, median sepal 3–5.5 mm long; petals falcate, ligulate to ovate-oblong, 4.8–6.5 \times ca 1.5 mm; lip midlobe narrowly oblong, 4–9 mm long, side lobes filiform, 7–20 mm long, much longer than the midlobe; spur cylindric-clavate, 6–11 mm long **32. H. ditricha**
35. Leaves cauline, in a cluster near the stem base or in the lower half of the stem, mostly 1–6.5 cm wide
 37. Plants robust, to 68 cm tall; leaves large, mostly 3–6.5 cm wide; lip side lobes pointing forwards and downwards **33. H. furcifera**
 37. Plants slender, 21–25 cm tall; leaves smaller, 1–1.3 cm wide; lip side lobes inserted at right angle on the midlobe and pointing to the sides, filiform, curved **34. H. masoniana**
34. Inflorescences dense or semi-dense
 38. Spur cylindric, 3–5 mm long, much shorter than the sepals, distally clavate **35. H. fulva**
 38. Spur 7–13 mm long, mostly longer than the sepals
 39. Leaves cauline and scattered along the stem; flowers white **36. H. avana**
 39. Leaves cauline in the lower half of the stem; flowers yellow **37. H. marginata**
21. Lip unlobed
 40. Lip spur absent or very short **20. H. dentata pro parte**
 40. Lip with a prominent spur 4.5–100 mm long
 41. Lip transversely elliptic in the basal part and linear above; spur clavate, half as long as pedicel plus ovary, curved forwards **38. H. prazeri pro parte**
41. Lip narrowly oblong-lanceolate, 1–3 mm wide
 42. Lip with a prominent linear claw; lip base not with a raising tongue in front of the spur entrance **39. H. linearis**
 42. Lip not with a prominent claw; lip base with a raising tongue 1.5–3 mm long in front of the spur entrance, blade of the tongue with a laminal flange
 43. Spur 20–47 mm long, slightly clavate; lip tongue without prominent lateral teeth but merely obscure lateral bulges, laminate longitudinal flange over almost the entire length of the tongue **40. H. mandersii**
 43. Spur 48–100 mm long; tongue in front of the spur mouth with distinct lateral teeth
 44. Spur 50–70 mm long; lip tongue apically bilobed, laminate flange a minute bulge **41. H. denticrostrata**
 44. Spur 48–100 mm long; lip tongue apically obtuse or mucronate, laminate flange apparently pronounced in distal half of the tongue only **42. H. hosseusii**
20. Plants mostly slender herbs; leaves 1–5, flat on the ground
 45. Central rostellum lobe very prominent and half as tall to nearly as tall as the anther; leaves 4–5, with pale mottling; flowers pink **43. H. rodgeri**
 45. Central rostellum lobe insignificant; flowers green, yellowish-green, greenish-brown, green and white, greenish-white, or entirely white
 46. Petals shallowly 2-lobed, anterior lobe a tooth ca 0.5 mm long **44. H. aitchisonii**
 46. Petals unlobed
 47. Leaves about 9.5 \times 6.8 cm; lip spur slender cylindric, about twice as long as pedicel plus ovary, ca 35 mm long **50. H. yomensis**
47. Leaves 1.2–8 \times 1–5 cm; lip spur mostly 7–16 mm long
 48. Pedicel plus ovary erect and close to the rachis, inflorescences therefore rather slender; flowers fairly large for this group, median sepal mostly 4.5–7 \times 3–5.5 mm, petals 5.2–8.5 \times 1–2 mm; lip side lobes 10–25 mm long **45. H. diphylla**
48. Pedicel plus ovary patent, inflorescences therefore rather wide; flowers smaller, median sepal 3–5 \times 1.5–3.3 mm, petals 3–5 \times 0.7–1.6 mm; lip side lobes most commonly 3.8–9 mm long, in one species sometimes up to 29 mm long
 49. Leaves 4–8 \times (2.5–)3–5 cm; flowers to 14 mm in diameter, white and green; petals ca 4.2 mm long; anther canals about 1 mm long **46. H. aff. poilanei**
 49. Leaves usually shorter and always narrower; flowers to 9 mm in diameter, green, yellowish-green, whitish or brown; petals shorter; anther canals short and insignificant
 50. Spur to 7.6 mm long, shorter than pedicel plus ovary, distally clavate, in peloric forms shorter or sometimes absent altogether; leaves 1–4, ovate to elliptic or cordate, 1.4–4 \times 1–2.5 cm; petals oblong, falcate, 3–4.5 \times 0.8–1.6 mm **47. H. reniformis**
50. Spur 7–15 mm long, as long as or longer than pedicel plus ovary, sometimes slightly clavate; leaves 3–4, elongate-ovate to elliptic, 2.5–7 \times 1–2.2 cm; petals linear, 3.2–4.2 \times 0.7–1 mm **48. H. humidicola**

1. *Habenaria stenopetala* Lindl., Gen. Sp. Orchid. Pl.: 319. 1835; Hooker, Fl. Brit. India 6: 134. 1890; Seidenfaden, Dansk Bot. Ark. 31(3): 70, fig. 37. 1977; Pearce & Cribb, Orch. Bhutan: 153. 2002; Chen & Cribb in Chen *et al.*, Fl. China 25: 151. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 17, fig. 1. 2009; Raskoti, Orch. Nepal: 156 (incl. colour photos). 2009; Averyanov, Turczaninowia 13(2): 44, fig. 24 & 34d–e. 2010; Kurzweil in Fl. Thailand 12(1): 142, fig. 82, pl. XI-3. 2011. Type: India, Kashmir, *Royle s.n.* (holotype **K-LINDL** [K000873755!]).

— *Habenaria sutepensis* Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 420. 1925; Seidenfaden & Smitinand, Orch. Thailand I: 34, fig. 24. 1959. Type: Thailand, Chiang Mai Province, Doi Suthep, in evergreen jungle, 5,200 ft, 27 Aug. 1911, *Kerr* 277 (holotype **K** [K000364317!]).

— ? *Habenaria mientienensis* Tang & F.T.Wang, Bull. Fan Mem. Inst. Biol. 7: 134. 1936. Type: Myanmar, Mandalay Region, minor locality illegible (? Sakangyi), 305 m, 10 Dec. 1926, *native collector* 3658 (holotype **K** [K000247489!]).

Terrestrial herbs, robust, 40–89 cm tall, glabrous. *Underground tubers* narrowly ellipsoid to fusiform, 2–5 × 1–2 cm. *Stems* terete, erect, stout. *Leaves* 5–10, cauline, clustered in the middle or upper part of the stem, elliptic-oblongate or oblong, 8–20 × 2.2–5.5 cm, acuminate. *Inflorescences* dense, many-flowered; rachis 4–20 cm long; floral bracts lanceolate or cuneate, slightly shorter to slightly longer than pedicel plus ovary, 13–28 × 3–7 mm, acuminate or aristate. *Flowers* 10–20 mm in diameter, usually green, pale green or dull brown, rarely whitish-green. *Pedicel and ovary* cylindric-fusiform, 10–22 mm long. *Sepals* elliptic or ovate-elliptic, aristate to caudate; median sepal erect, concave, to 16 × 4–7 mm; lateral sepals spreading, 8–18 × 3–6 mm. *Petals* erect, slightly shorter and narrower than the median sepal, very unequally bilobed; posterior lobe narrowly oblong, 5–13 mm long; anterior lobe short, 1.5–3 mm long. *Lip* 9–17 mm long, deeply 3-lobed above an undivided basal part 2–4 mm long, lobes linear or subulate; midlobe 7–13 mm long; side lobes 4–11 mm long; spur cylindric, 10–26 mm long, as long as pedicel plus ovary or longer, distally clavate. *Column* 3–5 mm long; anther erect with narrow connective, anther canals 1.5–2 mm long; stigma processes oblong-clavate, 1.5–3 mm long.

Myanmar.—Kachin State [Putao District, 305 m, Dec. 1911, *Toppin* 4167 (**CAL** [acc. no. 461993]); Myitkyina District, Tanai Township, 250 m, 16 Sept. 2005, *Tanaka et al.* 040152 (**MBK**)]. Shan State [Taunggyi District, 1893, *Abdul Khalil s.n.* (**CAL** [acc. no. 461998])]. Mandalay Region [minor locality illegible, *native collector* 3658 (holotype of *Habenaria mientienensis* Tang & F.T.Wang **K**)]; Myingyan District, 30 Oct. 2000, *Tanaka et al.* 021000 (**MBK**); same locality, 25 Sept. 2005, *Khin Myo Htwe* 66 (**TNS** [s]), fide *Tanaka et al.* (2015: 81)]. Chin State [Mindat District, 10 Oct. 2017, *Kim s.n.*, photographic record]. Not traced [Youbin Reserve, ca 90 m, *Rodger s.n.* (**CAL** [acc. no. 461994])]. Without locality [*Abdul Khalil s.n.* (**CAL**), fide *Misra et al.* (2011: 183)]. [9 records]

Distribution.—India, Himalayas, Bhutan, Bangladesh, Myanmar, Thailand, Laos, Vietnam, south-western China, Taiwan, southern Japan, Philippines and New Guinea.

Ecology and phenology.—Habitat information was not recorded in the collections from Myanmar; elevation ranges from 90 to 305 m. In other parts of the distribution area, the species is found in primary evergreen forest, in dry *Quercus* forest and on forest margins (Pearce & Cribb, 2002; Chen & Cribb, 2009; Kurzweil, 2009, 2011; Averyanov, 2010). Granite and limestone are given as bedrocks in Thailand. The elevation ranges from 300–1,800 m in Thailand, Vietnam and China. Higher elevations of up to 2,050 or 2,500 m, respectively, have been recorded in the Himalayas (Pearce & Cribb, 2002; Raskoti, 2009). Flowering in Myanmar has been recorded from September to December; in nearby countries flowering occurs between July and October.

2. *Habenaria pantlingiana* Kraenzl., Orchid. Gen. Sp. 1: 892. 1901; Seidenfaden, Opera Bot. 124: 12. 1995; Pearce & Cribb, Orch. Bhutan: 151. 2002; Chen & Cribb in Chen *et al.*, Fl. China 25: 152. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 16. 2009; Averyanov, Turczaninowia 13(2): 38, figs. 19 & 33g. 2010; Chen *et al.*, Fl. China 25, Illustrations: figs. 198.1–2 & 200. 2010; Kurzweil in Fl. Thailand 12(1): 128, fig. 72, pl. IX-4. 2011. Type: India, Sikkim, Namgarh, 5,000–7,000 ft, Aug. 1895, *Pantling* 415 (holotype **K** [K000247416!]; isotypes **BM** [BM000074610!], **CAL** [CAL0000055908!; CAL0000055909!; CAL0000094658!]; **P** [P 00439800!], **W!**). Fig. 1A.

— *Habenaria stenopetala* Lindl. var. *polytricha* Hook.f., Ann. Roy. Bot. Gard. (Calcutta) 5: 64, pl. 96. 1895; Seidenfaden, Dansk Bot. Ark. 31(3): 73, fig. 38. 1977 (in obs.).— *H. polytricha* (Hook.f.) Pradhan, Indian Orchids: Guide Identif. & Cult. 2: 683. 1979, **nom. illeg.** [as *polytrichia*].— *H. seshagiriana* A.N.Rao, J. Econ. Taxon. Bot. 6: 223. 1985; Seidenfaden, Opera Bot. 114: 56. 1992. Types: India, Sikkim, Choongtam, 6,000 ft, *Hooker s.n.* (syntype **K-LINDL** [K000881607!]; India, Naga Hills, *Prairie s.n.* (syntype **K!**).

Terrestrial herbs, robust, 40–70(–120) cm tall, glabrous. *Underground tubers* ovoid or oblong, 2–10 × 1–2.5 cm. *Stems* terete, erect, stout. *Leaves* 5–7, cauline, in a cluster near the stem middle, oblong-lanceolate or obovate-lanceolate, 6–15 × 2.5–4.8 cm, acute. *Inflorescences* semi-dense or dense, many-flowered; rachis 4–20 cm long; floral bracts narrowly ovate-lanceolate, longer or shorter than pedicel plus ovary, 16–25 × 2.5–6 mm, acuminate to caudate. *Flowers* 16–30 mm in diameter, green, petals and lip sometimes whitish; sepals and petals with long caudae measuring about one third or half of their length. *Ovary* 11–26 mm long; distinct from the ca 5 mm long pedicel. *Sepal* apices long acuminate-caudate; median sepal erect, concave, ovate-lanceolate, 22–30 × 3–6 mm; lateral sepals spreading, obliquely ovate-lanceolate, 18–29 × 3.5–4 mm. *Petals* deeply bilobed, lobes filiform, 15–20 mm long. *Lip* 15–28 mm long, deeply 3-lobed from the base, lobes filiform; midlobe 15–28 mm long; side lobes 14–28 mm long; spur cylindric, 16–23 mm long, mostly longer than the ovary, distal third clavate. *Column* 1.8–2 mm long; anther reflexed, ca 4.5 mm long, anther canals ca 2 mm long, pollinia oblong; stigma processes clavate. *Capsule* erect, cylindric, stalked.

Myanmar.— Sagaing Region [Mawlaik District, 800 m, 25 Nov. 2019, *Tanaka et al.* MY5790 (**RAF, TNS**); Kale District, 19 Nov. 2019, *Tanaka et al.* MY5543 (**RAF, TNS**)]. Shan State [Taunggyi District, 1893, *Abdul Khalil s.n.* (**CAL** [acc. no. 461998]); same locality, 1,200 m, 3 Sept. 2014, *Seo et al.* 100743 (**MBK**)]. Chin State [Mindat District, fide Aung *et al.* (2020: 87)]. [5 records]

Distribution.— Himalayas, north-eastern India, Myanmar, Thailand, Vietnam, southern China, Taiwan and southern Japan.

Ecology and phenology.— In Myanmar, the only collection where habitat information is available was made in evergreen forest at an elevation of 1,200 m. Another collection from Myanmar was made at 800 m but the habitat was not recorded. In other parts of the distribution area, *Habenaria pantlingiana* is found in broad-leaved evergreen forest and grassland. There is also a report of plants of this species growing in a cultivated potato field (Pearce & Cribb, 2002). Elevation appears to vary extensively, ranging from 400–700 m in China, 1,000–1,200 m in Vietnam, 1,500–2,000 m in Thailand and 1,520–1,830 m in Bhutan (Pearce & Cribb, 2002; Chen & Cribb, 2009; Kurzweil, 2009, 2011; Averyanov, 2010). Flowering in Myanmar has been recorded between the beginning of September and November; in nearby countries flowering occurs from July to December.

3. *Habenaria corymbosa* C.S.P. Parish & Rehb.f., Trans. Linn. Soc. London 30: 141. 1874; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883; Hooker, Fl. Brit. India 6: 136. 1890; Grant, Orchids Burma: 333. 1895; Seidenfaden & Smitinand, Orch. Thailand I: 26, fig. 16. 1959; Seidenfaden, Dansk Bot. Ark. 31(3): 81, fig. 44. 1977; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 20, fig. 2. 2009; Kurzweil in Fl. Thailand 12(1): 95, fig. 51. 2011. Type: Myanmar, Tenasserim, *Parish 329* (holotype **K** [K000247423!]; sketch W-R 21254!).

Terrestrial or rarely lithophytic herbs, robust, 95–130 cm tall, glabrous. *Leaves* 9–11, cauline and clustered in the middle of the stem, lanceolate, 10–21 × 2–4.1 cm, acute. *Inflorescences* dense or semi-dense, many-flowered; rachis 5–9 cm long; floral bracts lanceolate, shorter to slightly longer than the pedicel, 13–27 × 2.5–3 mm, acuminate. *Flowers* 8–10 mm in diameter, usually green, greenish-brown or reddish-green, in Thailand once reported as white. *Ovary* 9–12 mm long, with a narrow neck; sharply distinct from the mostly 21–22 mm long pedicel. *Sepals* subacute or obtuse; median sepal reflexed, hooded, lanceolate or oblong-suborbicular, mostly 3.8–6 × 2.4–3.5 mm; lateral sepals spreading, ovate, mostly 4.1–7 × 2.5–3.5 mm. *Petals* deeply bilobed, both lobes linear or narrowly oblong; anterior lobe 6–10 mm long; posterior lobe 3.5–6 mm long. *Lip* 7–10.5 mm long, deeply 3-lobed, all lobes linear;

midlobe 4.5–10 mm long; side lobes similar but narrower; spur cylindric, 14.5–20 mm long, much shorter than pedicel plus ovary, distal third clavate. *Column* 2.2–3 mm long; anther erect with narrow connective, anther canals 1–2.5 mm long; stigma processes 1.7–2 mm long. *Capsule* ovoid-fusiform, about 11 × 4.8 mm, stalked.

Myanmar.— Shan State [Taunggyi District, 16 Jan. 2016, *Saw Lwin SL 268 (RAF)*]. Tenasserim [*Parish 329* (holotype **K**; sketch W-R)]. [2 records]

Distribution.— Myanmar and Thailand.

Ecology and phenology.— The habitat was not recorded in the type collection. The recent collection from Shan State was made in a grassy area in secondary forest in a ravine; the elevation is not known. In neighbouring Thailand, the species is found in evergreen forest mostly over granite and limestone, often near streams, and was also reported in rock crevices (Kurzweil, 2009, 2011). Elevation in Thailand ranges from 600 to 1,900 m. The specimen from Myanmar's Shan State was flowering in January, but only the tip of the inflorescence had still a few fresh flowers on it while the rest of the inflorescence was already wilted; it can therefore be assumed that the actual flowering season would be from October/November till January. The flowering time of the type specimen is not known. In contrast, flowering in Thailand is mainly in January–May and July.

4. *Habenaria digitata* Lindl., Gen. Sp. Orchid. Pl.: 307. 1835; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883; Hooker, Fl. Brit. India 6: 134. 1890; Grant, Orchids Burma: 335. 1895; Seidenfaden, Dansk Bot. Ark. 31(3): fig. 43. 1977; Pearce & Cribb, Orch. Bhutan: 155. 2002.— *Bonatea herbacea* Wall. ex Lindl., Gen. Sp. Orchid. Pl.: 307. 1835, **pro syn.** Type: Bangladesh, Mt Pandua, *Wallich s.n.*, *Numer. List no. 7063* (holotype **K-W!**).

— *Bonatea benghalensis* Griff., Calcutta J. Nat. Hist. 4: 382. 1844. Type: India, West Bengal, Serampore, *Griffith s.n.* (not found).

— *Habenaria graveolens* Duthie, Fl. Upper Gangetic Plain 3(1–2): 222. 1920.— *H. graveolens* Duthie, Ann. Roy. Bot. Gard. (Calcutta) 9: 177, pl. 128. 1906, nom. inval. Type: India, Garhwal, Dehra Dun,

in sal forest, 20 July 1899, *MacKinnon 22728* (lectotype **DD**, designated by Deva & Naithani, 1986; isolectotype **AMES** [AMES01946639!], **K**). Syntypes: India, Garhwal, Kansrao, *Duthie 24177* (syntype **DD**; isosyntype **K**); India, Kumaun, Bageswar, *Inayat 24063* (syntype **DD**; isosyntype **K**).

Terrestrial herbs, up to 30(–50) cm tall, glabrous, usually drying light to dark brown. *Underground tubers* ovoid, stalked, about 2 cm in diameter. *Stems* stout, leafy. *Leaves* mostly 5–7, cauline, usually clustered in the middle part of the stem, orbicular to oblong-lanceolate or elliptic, up to 10 × 4 cm, acute, margin often undulate. *Inflorescences* lax; rachis mostly 5–10 cm long; lower floral bracts foliaceous and much longer than pedicel plus ovary, the upper slightly longer than pedicel plus ovary. *Flowers* small, green, greenish-yellow or whitish-green. *Ovary* not distinct from pedicel, both rather slender. *Sepals*: median sepal suborbicular, ca 6 × 6 mm, concave; lateral sepals obliquely ovate-lanceolate, to 10 × 4 mm, obtuse or subacute. *Petals* deeply bilobed; posterior lobe linear to falcately lanceolate, curved backwards and upwards; anterior lobe filiform, usually slightly exceeding the posterior lobe in length. *Lip* deeply 3-lobed with subequal narrowly oblong or linear lobes 12–14 mm long, lobes subequal in length or side lobes shorter than the midlobe; side lobes spreading and curved backwards; spur cylindric, about 11 mm long, slightly shorter than pedicel plus ovary, distal third clavate. *Column* 4–5 mm long; anther suberect with narrow connective, anther canals to 1.5 mm long, upwards-curved; stigma processes long, extending well beyond the spur mouth, clavate.

Myanmar.— Mandalay Region [Myingyan District, 11 July 2005, *Khin Myo Htwe 50 (TNS [s])*, fide Tanaka *et al.* (2015: 80)]. [1 record]

Distribution.— India, Himalayas, Bangladesh and central Myanmar.

Ecology and phenology.— No ecological information is available in the single collection from Myanmar. In neighbouring Assam, the plants of this species grow in forest (Gogoi, 2017). Elevation appears to vary extensively from lower altitudes ('Flora of Pakistan' website) to 2,000–3,000 m (Pradhan, 1976). The specimen from Myanmar was

flowering in the middle of July (Tanaka *et al.*, 2015); flowering in Assam occurs from July to October (Gogoi, 2017) and has been reported between September and December in India ('Flowers of India' website).

Notes.—Several species are morphologically very similar to *Habenaria digitata* and form a species complex together with it. The shared characters are cauline leaves (either in a cluster in the lower stem part or in the stem middle, or scattered all along the stem), lax inflorescences of mostly green or whitish- or yellowish-green flowers, absence of a sharp distinction of ovary and pedicel, sepals which are not caudate or aristate, and two-lobed petals with linear or narrowly oblong lobes. The complex is centred on the Indian Subcontinent although extending to New Guinea and northern Australia. It has not received much attention from workers as yet, and is very much in need of further research. In Myanmar, the group is very poorly represented, and is known to us from only four collections. This and the following two species belong to this complex.

5. *Habenaria amplexicaulis* Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 417. 1925; Seidenfaden & Smitinand, Orch. Thailand I: 26. 1959 [as *amplexicaule*]; Seidenfaden, Dansk Bot. Ark. 31(3): 74, fig. 41. 1977; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 22. 2009; Kurzweil in Fl. Thailand 12(1): 84, fig. 43, pl. IV-3. 2011. Type: Thailand, Chiang Mai Province, Doi Suthep, 395 m, 14 Nov. 1909, *Kerr 211* (holotype **K** [K000364331!, K000463142!]).

Terrestrial herbs, 19–30(–45) cm tall, glabrous, the specimens from Myanmar drying yellowish-brown. *Stems* terete, erect. *Leaves* 5–9, cauline and scattered along the stem, elliptic-ovate or lanceolate-obovate, to 11.6 × 3 cm, acute or obtuse. *Inflorescences* lax, 2- to 16-flowered; rachis mostly 3.5–13 cm long; floral bracts rather broadly ovate-lanceolate, mostly 15–23 × 5–9 mm, slightly shorter to longer than pedicel plus ovary, acuminate. *Flowers* 12–19 mm across; green and white, or entirely white. *Pedicel and ovary* 15–20 mm long. *Sepals* obtuse or subacute; median sepal erect, suborbicular, mostly 5–9 × 6–9 mm, truncate; lateral sepals obliquely ovate, mostly 7.5–9.5 × 2.5–4.5 mm. *Petals* deeply bilobed; posterior lobe strap-like, to 10 mm long; anterior lobe filiform, slightly shorter. *Lip* 10–13 mm long,

deeply 3-lobed with filiform lobes 9–12 × 0.5–0.75 mm; spur cylindric, 12–15 mm long, distal third clavate. *Column*: anther ca 2 mm long, anther canals ca 2.5 mm long. *Capsule* fusiform-elliptic, to 16.8 mm long.

Myanmar.—Mandalay Region [Pyinoolwin District, 500–800 m, 8 Nov. 1999, *Murata et al.* 334 (**MBK**)]. Magway Region [Gangaw District, 305 m, 20 Nov. 2011, *Ling Shein Man* 087869 (**MBK**)]. [2 records]

Distribution.—Central and western Myanmar, northern Thailand and Vietnam.

Ecology and phenology.—The two Myanmar specimens were collected at elevations ranging from 305 to 800 m; the habitat 'dry deciduous forest' has been recorded in one of them. In Thailand *Habenaria amplexicaulis* grows in bamboo thicket and in mixed forest over shale, sometimes in areas of disturbance; recorded from 225–1,300 m (Kurzweil, 2009, 2011). The two specimens from Myanmar were flowering in November; Thai specimens were found flowering in June and from September to December.

Notes.—This species belongs to the *Habenaria digitata* complex. For brief comments on this species complex see under *H. digitata*.

6. *Habenaria* cf. *gibsonii* Hook.f., Fl. Brit. India 6: 135. 1890 [as *gibsoni*]. Type: India, Pune, near Khora?, Kyreshwar (perhaps Khireswar), *Gibson s.n.* (lectotype **K** [K000247421!], designated by Bramhadande & Nandikar, 2023). Syntype: India, Pune, Khandala, *Gibson s.n.* (**K** [K000247473!]).

var. **foetida** Blatt. & McCann, J. Bombay Nat. Hist. Soc. 36: 16. 1932; Kumar *et al.*, Taiwania 63: 75. 2018.—*Habenaria foliosa* A.Rich. var. *foetida* (Blatt. & McCann) Bennet, J. Econ. Taxon. Bot. 5: 452. 1984. Type: India, Maharashtra, Khandala, Monkey Hill, *Hallberg s.n.* (holotype **BLAT**). [fide Kumar *et al.* (2018: 75)].

—*Habenaria thailandica* Seidenf., Dansk Bot. Ark. 31(3): 78, fig. 42. 1977; Seidenfaden, Opera Bot. 114: 56. 1992; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 23. 2009; Kurzweil in Fl. Thailand 12(1): 142, fig. 83, pl. XI-4. 2011. Type: Thailand, Chiang Mai Province, Doi Chiang Dao, in dry dipterocarp forest over granite, 7 June 1973, *Geesink et al.* 5759 (holotype **L** [L 0061379!]; isotype **BKF!**).

Terrestrial herbs, robust, 44–57 cm tall, glabrous, mostly drying light to dark brown. *Underground tubers* globose or ovoid. *Stems* terete, erect. *Leaves* to 12, cauline, scattered along the stem, broadly elliptic or lanceolate, mostly $4\text{--}12 \times 2.4\text{--}3.5$ cm, acute, margins often papillate. *Inflorescences* lax, up to 25-flowered; rachis 8–15 cm long; floral bracts lanceolate, longer than pedicel plus ovary, mostly to 27×4 mm, acute, margins often papillate. *Flowers* 10–20 mm in diameter, green or greenish-white, lip partly white; emitting a strong foul odour. *Pedicel and ovary* 14–25 mm long. *Sepals* subacute or obtuse; median sepal erect, hooded, ovate or suborbicular, $3.5\text{--}8 \times 4\text{--}9$ mm; lateral sepals recurved or spreading, obliquely ovate or ovate-lanceolate, $5\text{--}9.5 \times 2\text{--}5.5$ mm. *Petals* suberect or spreading, deeply bilobed, both lobes narrowly oblong, with the posterior lobe longer than the anterior one. *Lip* 5–9 mm long, deeply 3-lobed, all lobes narrowly oblong or linear; midlobe to 11 mm long, pendulous; side lobes shorter than midlobe, recurved; spur cylindric, 9–17 mm long, shorter than or as long as pedicel plus ovary, clavate. *Column* 2–4 mm long; anther erect with narrow connective, anther canals about 1 mm long; stigma processes short, to 1.5 mm long, adpressed to the lip around the spur entrance.

Myanmar.— Chin State [Mindat District, 1,370 m, 10 June 1956, *Kingdon-Ward 22340* (BM), identification uncertain]. [1 record]

Distribution.— India, ? western Myanmar, Thailand, Laos, Vietnam and Cambodia.

Ecology and phenology.— The collector's notes indicate that the plant from Myanmar was growing at an elevation of 1,370 m in half shade at the edge of a forest. In neighbouring Thailand, the species occurs in dry deciduous or evergreen broad-leaved forest and bamboo forest over granite, shale and limestone at elevations of 20–645 m (Kurzweil, 2009, 2011 [as *Habenaria thailandica*]). The specimen from Myanmar was flowering in June; in Thailand flowering occurs mainly from May to July, rarely as late as October.

Notes.— This is another species in the *Habenaria digitata* complex. During our study a specimen was provisionally identified as *H. thailandica* which was later placed in the synonymy of *H. gibsonii* var. *foetida* (Kumar *et al.*, 2018: 75). We have referred the specimen to this species based on plant

size, flower odour, relative length of the petal lobes and the length of its stigmas, but realize that a detailed study of the entire *H. digitata* complex is needed in order to confirm this.

A strong pungent odour of the flowers was reported on the herbarium label of this specimen, based on observation in the field at the time of collecting. A strong foul odour appears characteristic of this variety (see also Kumar *et al.*, 2018), while most other *Habenarias* in the region have slightly sweetly scented or odourless flowers. However, flower odour is rarely recorded as taxonomists commonly work with herbarium material where floral scent is normally absent.

7. *Habenaria myriotricha* Gagnep., Bull. Soc. Bot. France 78: 72. 1931; Seidenfaden, Bot. Tidsskr. 68: 43. 1973 (in obs.); Seidenfaden, Dansk Bot. Ark. 31(3): 86, fig. 50. 1977 (in obs.); Seidenfaden, Opera Bot. 114: 60. 1992; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 30. 2009; Averyanov, Turczaninowia 13(2): 48, fig. 27. 2010; Kurzweil in Fl. Thailand 12(1): 126, fig. 71, pl. IX-3. 2011.— *Fimbrorchis myriotricha* (Gagnep.) Szlach., Orchidee (Hamburg) 55: 491. 2004.— *Pecteilis myriotricha* (Gagnep.) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 52. 2018. Type: Laos, Cam-Keut, *Spire 260* (lectotype **P** [P00430640!]), first step designated by Seidenfaden, 1992; second step designated by Kurzweil, 2009; isolectotype **P** [P00430641!]).

Terrestrial or lithophytic herbs, 19–60 cm tall, glabrous except sometimes for the margins of the bracts. *Tubers* cylindric, to 4 cm long. *Leaves* 2–6, cauline, scattered in the lower half of the stem, lanceolate, $8\text{--}15 \times 2\text{--}3.5$ cm, acute. *Inflorescences* lax, up to 20-flowered; rachis 3–12 cm long; floral bracts narrowly lanceolate, usually shorter than pedicel plus ovary, $15\text{--}25 \times 2\text{--}5$ mm, acuminate. *Flowers* white. *Pedicel and ovary* cylindric-fusiform, 20–40 mm long. *Sepals* acute; median sepal erect, forming a hood together with the petals, concave, ovate, $6\text{--}8.5 \times 4\text{--}4.2$ mm; lateral sepals spreading or reflexed, obliquely ovate, $6.5\text{--}11.5 \times 4.75\text{--}4.9$ mm. *Petals* erect, linear-lanceolate, $5\text{--}8 \times 0.5\text{--}1$ mm, acute. *Lip* 10–23 mm long, deeply 3-lobed above a basal unlobed part of 4.5–7 mm; midlobe linear-oblong, 4–8 mm long; side lobes 13–23 mm long, divided into 15–30 unbranched

laciniae; spur cylindric, 25–40 mm long, mostly longer than pedicel plus ovary, distally slightly clavate. *Column* 3.5–4.5 mm long, shortly stipitate; anther erect, anther canals 1.7–3 mm long; stigma processes shorter than the anther canals.

Myanmar.—Tanintharyi Region [Dawei District, 610 m, Aug. 1961, *Keenan et al.* 743 (A); same locality, 640 m, Aug. 1961, *Keenan et al.* 771 (A, E, K, RAF); same locality, 215 m, Aug. 1961, *Keenan et al.* 841 (E, RAF); same locality, 670 m, Aug. 1961, *Keenan et al.* 887 (A, E, K, RAF); same locality, 305 m, Aug. 1961, *Keenan et al.* 1379 (A, E, K, RAF); same locality, 640 m, 14 Sept. 2012, *Saw Lwin et al.* *TNRO* 150 (SING, SING [s]). [6 records].

Distribution.—Southern Myanmar, northern Thailand, Laos and Vietnam.

Ecology and phenology.—In Myanmar recorded in damp or wet rocky areas or in damp places on the forest floor. Elevation ranges from 215 to 670 m. In neighbouring Thailand, once recorded in a limestone crack at 600 m (Kurzweil, 2009, 2011). In Myanmar the plants are flowering in August and September; in Thailand the flowering season starts already in June and extends through to September.

8. *Habenaria trichosantha* Lindl., Gen. Sp. Orchid. Pl.: 324. 1835; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883; Hooker, Fl. Brit. India 6: 138. 1890; Grant, Orchids Burma: 344. 1895; Seidenfaden, Dansk Bot. Ark. 31(3): 86, fig. 49. 1977; Pearce & Cribb, Orch. Bhutan: 153. 2002; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 31. 2009; Kurzweil in Fl. Thailand 12(1): 145, fig. 84. 2011.—*Fimbrorchis trichosantha* (Lindl.) Szlach., Orchidee (Hamburg) 55: 491. 2004.—*Pecteilis trichosantha* (Lindl.) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 53. 2018. Type: Myanmar, Mandalay Region, Kyaukse District, Taong Dong, on river Mytinge, 1826, *Wallich s.n.*, *Numer. List no.* 7028 (holotype **K-LINDL** [K000873757]; isotypes **K-W** [K001126607!, K001126608]). Fig. 1D.

Terrestrial herbs, mostly robust, 21–60 cm tall, glabrous except for the margins of the bracts and the sepals, plants turning light brown or medium brown when dried. *Tubers* globose. *Leaves* 2–4, cauline

and scattered in the lower part of the stem, elliptic-ovate, 5–11 × 1.6–2.8 cm, acute. *Inflorescences* semi-dense or lax, 6–9-flowered; rachis 5–7.8 cm long; floral bracts lanceolate, shorter than pedicel plus ovary, 16–25 × 3–4 mm, acuminate to caudate, margins denticulate to pubescent. *Flowers* 20–27 mm in diameter, white, sepal outside greenish. *Pedicel and ovary* narrowly cylindric-fusiform, 20–39 mm long. *Sepals* acuminate; median sepal cohering with the petals, concave, erect, ovate-oblong, 10–15 × 3.5–4.5 mm, margins denticulate or pubescent; lateral sepals reflexed, lanceolate to ovate-oblong, 11–16 × 4–6.5 mm. *Petals* linear-falcate, 8–11 × 1.3–1.5 mm, acuminate, margins in some specimens serrate. *Lip* deeply 3-lobed above a short basal claw; midlobe linear-lanceolate, 7–11 mm long; side lobes fringed, laciniae filiform, branched, 7–11 mm long; spur cylindric, mostly 23–50 mm long or rarely to 90 mm long, longer than pedicel plus ovary, distally clavate. *Column* 2–3 mm long; anther with wide connective, anther canals 1–2 mm long; stigma processes short and globose. *Capsule* ca 17 × 6 mm.

Myanmar.—Upper Myanmar [Sept. 1908, *Hobart s.n.* (BM); Sept. 2005, *Kurzweil s.n.*, photographic record]. Kachin State [Bhamo District, 10 Sept. 1968, *Anderson s.n.* (CAL [acc. no. 462161]); district not known, 1897, *Shaik Mokim s.n.* (CAL [acc. no. 462159 & 462160]). Shan State [Taunggyi District, 500 m, 1 Sept. 2014, *Seo et al.* 100655 (MBK); same locality, 395 m, 12 Sept. 2015, *Baba et al.* 103104 (MBK)]. Mandalay Region [Pyinoolwin District, 1,065 m, 25 Sept. 1927, *Bogg BG* 11 (K); same locality, *Bogg s.n.* in *Maymyo Bot. Gard.* 13514 (K); Kyaukse District, *Wallich s.n.*, *Numer. List no.* 7028 (holotype **K-LINDL**; isotype **K-W**); Myingyan District, Oct. 1935, *Dickason* 5466 (AMES)]. Chin State [Falam District, 1,830 m, 29 Sept. 1910, *Venning* 32 (K); same locality, 1,980 m, 3 Oct. 1910, *Venning* 39 (K); same locality, 2,010 m, 10 Oct. 1910, *Venning* 44 (K); Mindat District, 22 Oct. 2013, *Kim s.n.*, photographic record; same locality, fide Kang *et al.* (2017: 82)]. Mon State [Mawlamyine District, 1859, *Brandis s.n.* (CAL [acc. no. 462162 & 462163]); same locality, *Parish* 219 (W); same locality, *Gilbert s.n.* (W); same locality, *Brandis s.n.* (CAL)]. Tanintharyi Region [Dawei District, 520 m, Aug. 1921, *Russell* 2143 (CAL)]. Without locality [305 m, *Boxall s.n.* (K)]. [21 records]

Distribution.— Eastern Himalayas, north-eastern India, Bhutan, Myanmar and Thailand.

Ecology and phenology.— In Myanmar on open ground, in deciduous forest, ‘jungle’ and bamboo forest, often near streams, at elevations ranging from 305 to 2,010 m. In Bhutan growing on sandy soil in *Pinus roxburghii* forest and in deciduous oak forest at 1,680–1,830 m (Pearce & Cribb, 2002). The habitat of the single doubtful collection reported in Thailand (Kurzweil, 2009) is not known. Flowering in Myanmar has been recorded between August and October; Bhutanese plants are flowering in July and August. The flowering time was not recorded in the doubtful collection from Thailand.

9. *Habenaria triquetra* Rolfe, Bull. Misc. Inform. Kew 1906: 87. 1906. Type: Myanmar, Shan State, *Hildebrand s.n.* (holotype **K** [K000247493!]). Fig. 2A.

Herbs, terrestrial, robust, 30–45 cm tall, plants turning dark brown or black when dried. *Leaves* 8, cauline, scattered along the stem, oblong-lanceolate or oblong, 6–10 × 2–3 cm, acute. *Inflorescences* lax, 10-flowered; rachis ca 10 cm long; floral bracts foliaceous, longer than the flowers, 30–75 mm long. *Flowers* with light green sepals and white petals and lip. *Pedicel and ovary* prominently 3-angled or 3-winged, 15–20 mm long. *Sepals*: median sepal cohering with the petals to form a hood, concave, elliptic-oblong, ca 20 × 8 mm, acuminate; lateral sepals obliquely lanceolate, ca 20 × 5 mm, apiculate. *Petals* obliquely lanceolate, ca 20 mm long, subacute. *Lip* ca 20 mm long, 3-lobed; midlobe oblong, ca 8 mm long, obtuse; side lobes lacinate with filiform lobules; spur cylindric, ca 20 mm long. *Column* broad; anther canals suberect, incurved, about 2 mm long; auricles linear, ca 2 mm long, arcuate; stigma processes arcuate, ca 4 mm long, clavate.

Myanmar.— Shan State [district not known, *Hildebrand s.n.* (holotype **K**)]. [1 record]

Distribution.— Endemic; so far only known from the type collection.

Ecology and phenology.— Information on habitat and flowering phenology was not provided in the protologue or on the label of the type specimen.

Notes.— Morphologically well characterised by the 3-angled pedicel plus ovary and the prominent linear auricles of the column.

10. *Habenaria yuana* Tang & F.T.Wang, Bull. Fan Mem. Inst. Biol. 7: 135. 1936; Chen & Cribb in Chen *et al.*, Fl. China 25: 153. 2009; Kurzweil, Thai Forest Bull., Bot. 45: 18. 2017. Type: China, Sichuan, Si-Chang-Hsien, under bushes, 2,600 m, 10 Aug. 1932, *Yü 1317* (holotype **PE**). Fig. 1B.

— *Habenaria limprichtii* auct., non Schltr.: Seidenfaden, Dansk Bot. Ark. 31(3): 82, fig. 46. 1977; Seidenfaden, Opera Bot. 114: 57. 1992; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 24, fig. 3. 2009; Kurzweil in Fl. Thailand 12(1): 114, fig. 63, pl. VIII-1. 2011; Averyanov, Turczaninowia 13(2): 47, fig. 25a–b. 2010.

— *Habenaria oligoschista* auct., non Schltr.: Seidenfaden & Smitinand, Orch. Thailand I: 44, fig. 32, pl. II (2697); IV(2): 727. 1959–1965.

Terrestrial herbs, 26–80 cm tall, glabrous except for the leaf tips, ovary and petal margins, plants turning dark brown or black when dried. *Underground tubers* oblong or fusiform, 2–3.5 cm long. *Stems* terete, erect, stout. *Leaves* mostly 4–7, cauline, scattered along the stem, narrowly oblong-lanceolate, ovate-elliptic or ovate, 2.5–20 × 1.3–4 cm, acute. *Inflorescences* semi-dense or lax, 2–10-flowered; rachis mostly 5–18 cm long; floral bracts foliose, elliptic-ovate, mostly 16–45 × 6–12 mm, longer than pedicel plus ovary, acuminate, margins papillose. *Flowers* 34–60 mm in diameter, green, yellowish-green or whitish-green. *Pedicel and ovary* cylindric-fusiform, 19–40 mm long. *Sepals*: median sepal erect, forming a hood together with the petals, elliptic or oblong-elliptic, mostly 16–22 × 8–15 mm, obtuse or subacute; lateral sepals spreading or recurved, obliquely elliptic-lanceolate, 16–27 × 6–7.5 mm, acute. *Petals* obliquely subovate-falcate, with a prominent basal lobe on the anterior side, 20–26 × 8–11 mm, acute. *Lip* 22–35 mm long, deeply 3-lobed above a basal claw; midlobe linear or oblong, mostly 12–18 mm long; side lobes fringed, with up to 10 linear laciniae; spur cylindric, 13–25 mm long, shorter than pedicel plus ovary, clavate. *Column* 3–5 mm long; anther thecae situated on the far corners of a horseshoe-shaped connective 8–15 mm wide, anther canals 2–4 mm long, up-curved, pollinia narrowly ellipsoid, with long linear caudicles; auricles shortly stalked; stigma processes 6–8 mm long, curved upwards, clavate.

Myanmar.— Shan State [Taunggyi District, 1,525 m, July 1939, *Dickason 8696* (**AMES**); same locality, 19 Aug. 2018, *Kim s.n.*, photographic

record]. Mandalay Region [Myingyan District, 25 Sept. 2005, *Khin Myo Htwe 65* (TNS [s]), fide Tanaka *et al.* (2015: 82)]. Chin State [Falam District, 1,890 m, 8 Sept. 1910, *Venning 24* (K); same locality, 1,980 m, 30 Sept. 1910, *Venning 36* (AMES, K); Mindat District, 1,525 m, 30 July 2008, *Fujikawa et al. 053010* (MBK); same locality, 1,740 m, 5 Aug. 2008, *Fujikawa et al. 053123* (MBK); same locality, 2,000 m, 10 Sept. 2012, *Ling Shein Man 091720* (MBK); same locality, 1,520–1,600 m, 21 Aug. 2013, *Fujikawa et al. 094080* (MBK); same locality, 1,670–2,445 m, 2 Sept. 2013, *Fujikawa et al. 094940* (MBK); same locality, 22 Aug. 2016, *Kurzweil d13891*, photographic record]. [11 records]

Distribution.— Myanmar, Thailand, Vietnam and south-western China.

Ecology and phenology.— In Myanmar and Thailand in grassy areas in pine forest and secondary evergreen forest, at elevations ranging from 1,100 to 2,445 m (see the specimens from Myanmar that were examined here; Kurzweil, 2009, 2011 [both as *limprichtii*], 2017). Elevation of Chinese specimens is considerably higher, up to 2,600 m (Chen & Cribb, 2009). Throughout the range of this species, flowering has been reported from July to September.

Notes.— In the past the species was frequently misidentified as *Habenaria limprichtii*.

11. *Habenaria intermedia* D.Don, Prodr. Fl. Nepal.: 24. 1825; Hooker, Fl. Brit. India 6: 138. 1890; Chen & Cribb in Chen *et al.*, Fl. China 25: 154. 2009; Raskoti, Orch. Nepal: 154 (incl. colour photos). 2009.— *Kryptostoma intermedium* (D.Don) Olszewski & Szlach., Ann. Bot. Fenn. 37: 299. 2000.— *Ochrorchis intermedia* (D.Don) Szlach., Richardiana 4: 55. 2004. Type: Nepal, Gosaingthan, *Wallich s.n.*, Numer. List no. 7030 (K [K001126613!]).

Terrestrial herbs, 23–35 cm tall, glabrous except for the sepals, petals and lip, plants turning dark brown or black when dried. *Underground tubers* ellipsoid, 1.5–3 × 1–2 cm. *Stems* terete, erect, stout. *Leaves* 3–7, cauline, scattered along the stem, ovate-lanceolate, 3.5–8 × 2–4 cm, acute, with three prominent veins. *Inflorescences* lax, mostly 3–7-flowered; rachis 6–15 cm long; floral bracts ovate-lanceolate, shorter to slightly longer than pedicel and ovary, 25–50 mm long, acuminate. *Flowers* greenish with white petals. *Pedicel and ovary* terete, 25–45 mm long. *Sepals* acute, ciliate;

median sepal forming a hood together with the petals, erect, ovate-oblong, concave, 20–22 × ca 12 mm; lateral sepals reflexed, obliquely falcate-lanceolate, 26–30 × ca 6 mm. *Petals* erect, obliquely subovate-falcate, ca 22 × 8 mm, acute, margins ciliate. *Lip* 28–30 mm long, deeply 3-lobed, lobes ciliate especially at the base; midlobe linear, 18–20 mm long; side lobes linear, about as long as the midlobe, with 8–10 filiform lobules to 10 mm long; spur cylindric, (55–)70–85 mm long, much longer than pedicel plus ovary, distal third clavate. *Column* ca 5 mm long; anther connective 2–5 mm wide, pollinia ovoid, caudicles linear; stigma processes clavate, ca 14 mm long.

Myanmar.— Shan State [Taunggyi District, 1893, *Abdul Khalil s.n.* (CAL [acc. no. 462145])]. Chin State [Mindat District, 2,135 m, 17 June 1956, *Kingdon-Ward 22357* (BM); same locality, 1,830–1,980 m, 21 June 1956, *Maung Gale-2 & Chit Ko Ko 5595* (RAF); same locality, 2,345 m, 9 Aug. 2008, *Yasuda 060067* (MBK); same locality, 2,500 m, 24 June 2009, *Tanaka & Yukawa 081134* (MBK); same locality, 2,030–2,295 m, 27 June 2009, *Tanaka & Yukawa 081279* (MBK); same locality, 2,500 m, 28 June 2009, *Tanaka & Yukawa 081398* (MBK); same locality, 2,500 m, 5 July 2013, *Mu Mu Aung et al. 092340* (MBK)]. [8 records]

Distribution.— Pakistan, Himalayas, north-eastern India, Myanmar and south-western China.

Ecology and phenology.— In Myanmar, the plants grow in open meadow, pine forest and open areas in evergreen forest. Elevation ranges from 1,830 to 2,500 m. Considerably higher elevations of up to 3,000 m have been reported in specimens from China and Nepal (Chen & Cribb, 2009; Raskoti, 2009). Flowering in Myanmar is mainly in June to August which corresponds with other countries in mainland Asia.

12. *Habenaria arietina* Hook.f., Fl. Brit. India 6: 138. 1890; Pearce & Cribb, Orch. Bhutan: 147. 2002; Chen & Cribb in Chen *et al.*, Fl. China 25: 154. 2009; Raskoti, Orch. Nepal: 152 (incl. colour photos). 2009.— *H. pectinata* D.Don var. *arietina* (Hook.f.) Kraenzl., Orchid. Gen. Sp. 1: 405. 1898.— *H. intermedia* D.Don var. *arietina* (Hook.f.) Finet, Rev. Gén. Bot. 13: 530. 1901.— *Ochrorchis arietina* (Hook.f.) Szlach., Richardiana 4: 53. 2004. Types: India, Kumaon, *Blinkworth s.n.* in *Wallich*,

Numer. List no. 7029B pro parte (syntype **K-LINDL**; isosyntype **K-W**); ? India, Mt Sylhet, *De Silva s.n.* in *Wallich, Numer. List no. 7029C* (syntype **K-LINDL**; isosyntype **K-W**); India, Sikkim, *Hooker s.n.* (syntype **K** [K000247427!]); India, Khasia, *Hooker & Thompson 260A* (syntype **K-LINDL**; isosyntype **K**; probable isosyntype **GH** [00256489!]; probable isosyntype **AMES** [AMES00256489!]).

— *Habenaria pectinata* D.Don var. *gigantea* Pradhan, Indian Orchids: Guide Identif. & Cult. 1: 73. 1976.— *H. ensifolia* Lindl. var. *gigantea* (Pradhan) P.K.Sarkar, J. Econ. Taxon. Bot. 5: 1008. 1984. Type: India, Khasia Mts, Kala Pani, *Hooker & Thomson 260* (holotype **K** [K000247425!]).

— *Habenaria pectinata* D.Don var. *khasiensis* Pradhan, Indian Orchids: Guide Identif. & Cult. 1: 73. 1976.— *H. ensifolia* Lindl. var. *khasiensis* (Pradhan) P.K.Sarkar, J. Econ. Taxon. Bot. 5: 1008. 1984. Type: India, Khasia, *Griffith s.n.* (Kew Distr. No. 5307) (holotype **K** [K000247426!]).

Terrestrial herbs, robust, 35–80 cm tall, plants turning dark brown or black when dried. *Tubers* oblong or fusiform, 2–5 × 1–2 cm. *Stems* terete, erect. *Leaves* 5–7, cauline, scattered along the stem, ovate-lanceolate to lanceolate, 4–11 × 1.2–3 cm, acute or acuminate. *Inflorescences* subdensely 5- to several-flowered; rachis 15–30 cm long; floral bracts lanceolate, 16–30 mm long, nearly as long as pedicel plus ovary, acute or acuminate. *Flowers* white or greenish-yellow, lip greenish-white. *Pedicel and ovary* terete, 25–40 mm long, minutely glandular-pubescent. *Sepals* ciliate, acute; median sepal erect, forming a hood together with the petals, concave, oblong or lanceolate, 14–20 × 4–6 mm; lateral sepals spreading or reflexed, falcate-lanceolate, 14–20 × 4–7 mm. *Petals* obliquely subovate-falcate, 14–19 × ca 8 mm, adaxially pubescent, margin glandular-pubescent. *Lip* to 30 mm long, deeply 3-lobed, lobes nearly equal in length, ciliate especially at the base, lip basally clawed; midlobe linear-oblong, 10–12 × ca 2 mm; side lobes linear, 12–20 × 7–9 mm, pectinate-fimbriate with ca 10 filiform lobules; spur cylindric, 20–40 mm long, nearly as long as or slightly longer than pedicel plus ovary, clavate. *Column* ca 3 mm tall; anther connective 3–4 mm wide, pollinia ovoid, caudicles linear; stigma processes elongate, 6–8 mm long.

Myanmar.— Upper Myanmar [1894, *Abdul Khalil s.n.* (**CAL** [acc. no. 462143, with a sketch by

Pantling])]. Shan State [Taunggyi District, 1893, *Abdul Khalil s.n.* (**CAL**); southern part, 1909, *MacGregor 817* (**CAL** [acc. no. 462142], **E**)]. Chin State [fide Aung *et al.* (2020: 86)]. [4 records]

Distribution.— Northern India, Nepal, Bhutan, Upper Myanmar and south-western China.

Ecology and phenology.— Not known in Myanmar. In other parts of the distribution area reported on grassy slopes, hillsides, in deciduous *Quercus* and broad-leaved forest at elevations ranging from 1,400 to 3,600 m (Pearce & Cribb, 2002; Chen & Cribb, 2009; Raskoti, 2009). Flowering in July and August.

Notes.— Reported to occur in Myanmar by Kress *et al.* (2003) and Aung *et al.* (2020), and also several herbarium specimens in **CAL**, **E** and **RAF** have been referred to *Habenaria arietina*. However, the first two authors of this paper examined a few of these herbarium specimens and re-identified the material as belonging to *H. yuana* Tang & F.T.Wang and *H. intermedia* D.Don. Because a few specimens have not been re-examined by us yet, we provisionally list the species as occurring in Myanmar.

13. *Habenaria* cf. *limprichtii* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 4: 50. 1919; Chen & Cribb in Chen *et al.*, Fl. China 25: 153. 2009; Chen *et al.*, Fl. China 25, Illustrations: fig. 203.1–4. 2010; Kurzweil, Thai Forest Bull., Bot. 45: 21. 2017.— *H. pectinata* D.Don var. *limprichtii* (Schltr.) Pradhan, Indian Orchids: Guide Identif. & Cult. 1: 72. 1976.— *Kryptostoma limprichtii* (Schltr.) Szlach. & Olszewski, Fl. Cameroun 34: 231. 1998.— *Ochyrorchis limprichtii* (Schltr.) Szlach., Richardiana 4: 55. 2004. Type: China, Yunnan, Tali-fu, Bergwiesen des Tsang schan, 2,500–3,000 m, Aug. 1913, *Limpricht 1024* (isotype **WU** [WU038982!]).

— *Habenaria oligoschista* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 4: 51. 1919.— *Kryptostoma oligoschistum* (Schltr.) Szlach. & Olszewski, Fl. Cameroun 34: 231. 1998.— *Ochyrorchis oligoschista* (Schltr.) Szlach., Richardiana 4: 55. 2004. Type: China, Guizhou, Pin-fa, July 1902, *Esquirol s.n.* (holotype **B**, destroyed).

— non *Habenaria limprichtii* auct. Schltr.: Seidenfaden, Dansk Bot. Ark. 31(3): 82, fig. 46. 1977; Seidenfaden, Opera Bot. 114: 57. 1992;

Kurzweil, Thai Forest Bull., Bot. (Special Issue): 24, fig. 3. 2009; Kurzweil in Fl. Thailand 12(1): 114, fig. 63, pl. VIII-1. 2011; Averyanov, Turczaninowia 13(2): 47, fig. 25a–b. 2010 (= *H. yuana* Tang & F.T.Wang).

— non *Habenaria oligoschista* auct. Schltr.: Seidenfaden & Smitinand, Orch. Thailand I: 44, fig. 32, pl. II (2697); IV(2): 727. 1959–1965 (= *H. yuana* Tang & F.T.Wang).

Terrestrial herbs, 18–60 cm tall, plants turning dark brown or black when dried; with underground tubers. *Stems* terete, erect, stout. *Leaves* 4–7, cauline, scattered along the stem, ovate to oblong-lanceolate, blade 4–10 × 1.5–3 cm, acuminate or acute. *Inflorescences* lax, 3–20-flowered; rachis 5–20 cm long; floral bracts ovate-lanceolate, as long as or longer than pedicel plus ovary, 30–40 × ca 10 mm, acuminate. *Flowers*: sepals green or greenish-white, petals and lip white. *Pedicel and ovary* 20–25 mm long. *Sepals* apically ciliate; median sepal forming a hood together with the petals, erect, ovate-elliptic, concave, 18–20 × 9–10 mm, obtuse; lateral sepals reflexed, obliquely ovate, 19–21 × 9–10 mm, acute. *Petals* erect, falcately oblong, 5–7 mm wide, ciliate on the margins. *Lip* deeply 3-lobed, lobes equally long, hairy; midlobe linear, ca 15 × 1 mm long; side lobes linear, with 8–10 filiform lobules; spur cylindric, 20–30 mm long, slightly shorter to slightly longer than pedicel plus ovary, obtuse. *Column* with the two anther thecae situated at the far corners of a long horseshoe-shaped connective 10–12 mm wide; pollinia ovoid; caudicles linear; stigma processes clavate.

Myanmar.—Kachin State [Myitkyina District, Chipwi Township, 1,830–2,135 m, 1914, *Kingdon-Ward 1668* (E), identification uncertain]. [1 record]

Distribution.—? Northern Myanmar, northern Thailand, Vietnam and south-western and central China.

Ecology and phenology.—The single collection from Myanmar was made in grassland over granite at an elevation of 1,830–2,135 m. In China and Thailand *Habenaria limprichtii* is found in forest, thicket and grassland at 1,800–3,500 m (Chen & Cribb, 2009; Kurzweil, 2017). The flowering time is not known in Myanmar; flowering of Chinese and Thai specimens has been recorded between June and August.

Notes.—This species has been listed in much of the literature on Thai and Indochinese orchids. However, the name has mostly been misapplied, as the majority of specimens listed under this name are referable to *Habenaria yuana* Tang & F.T.Wang.

The above description is that of typical specimens of *Habenaria limprichtii*, following Flora of China (Chen & Cribb, 2009).

14. *Habenaria pectinata* D.Don, Prodr. Fl. Nepal.: 24. 1825; Hooker, Fl. Brit. India 6: 137. 1890; Pearce & Cribb, Orch. Bhutan: 151. 2002; Chen & Cribb in Chen *et al.*, Fl. China 25: 153. 2009; Raskoti, Orch. Nepal: 155 (incl. colour photos). 2009.—*Orchis pectinata* Sm., Exot. Bot. 2: 77. 1805, **nom. illeg.**, non Thunb. 1794.—*Kryptostoma pectinatum* (D.Don) Olszewski & Szlach., Ann. Bot. Fenn. 37: 299. 2000.—*Ochrorchis pectinata* (D.Don) Szlach., Richardiana 4: 55. 2004. Type: Nepal, Suemba, *Buchanan-Hamilton s.n.* (holotype LINN).

Terrestrial herbs, mostly robust, 22–70 cm tall, glabrous except for the sepals and petals, plants turning dark brown or black when dried. *Underground tubers* oblong, 1.5–3.5 × 0.8–1.5 cm. *Stems* erect, stout. *Leaves* 6–8, cauline, mainly in the upper stem part, lanceolate to linear-lanceolate, 5–15 × 0.5–3.4 cm, acuminate. *Inflorescences* semi-dense or dense, mostly 6–13-flowered; rachis 6–20 cm long; floral bracts narrowly lanceolate, much longer than pedicel plus ovary, 25–50 mm long, acuminate. *Flowers* 20–30 mm in diameter, with green sepals, and whitish-green or white petals and lip. *Pedicel and ovary* somewhat arching, 15–23 mm long. *Sepals* with ciliate apical margin; median sepal erect, forming a loose hood together with the petals, concave, elliptic-ovate, 12–22 × 4–7 mm, obtuse or acute; lateral sepals spreading, oblique, elliptic-ovate, 16–19 × 5–6 mm, acute. *Petals* unlobed, falcately oblong, 14–18 × 3–5 mm, upper surface hairy, acute, margins ciliate. *Lip* somewhat longer than the sepals, deeply 3-lobed above a basal claw; midlobe linear, 11–20 mm long; side lobes pectinate, 11–20 mm long, with 5–15 filiform lobules; spur cylindric, stout, 12–20 mm long, shorter than pedicel plus ovary, clavate. *Column* 2.5–4.3 mm long; anther cells diverging, connective ca 2 mm wide, anther canals about 3 mm long and pointing upwards, pollinia narrowly

ellipsoid, caudicles filiform and curved; stigma processes slender, clavate, up to 12 mm long.

Myanmar.—Chin State [Falam District, 1,980 m, 23 July 1910, *Venning 15* (AMES, K); same locality, 1,980 m, 23 July 1910, *Venning 16* (AMES, K); same locality, 1,980 m, 30 Sept. 1910, *Venning 35* (AMES, K); Mindat District, fide Kingdon-Ward (1959: 62)]. [4 records]

Distribution.—Pakistan, northern India, Himalayas, western Myanmar and south-western China.

Ecology and phenology.—Habitat information is not given in specimens from Myanmar; they were growing at 1,980 m elevation. Kingdon-Ward (1959: 62) pointed out that the species is a typical element of pine savanna on Mount Victoria (Natma Taung) in Chin State in western Myanmar. In nearby countries, the species is found in forest and grassland at elevations ranging from 1,000 to 3,500 m (Pearce & Cribb, 2002; Chen & Cribb, 2009; Raskoti, 2009). Flowering in Myanmar occurs in July and September, which largely corresponds with the flowering time of the species in Pakistan, Nepal and China ('Flora of Pakistan' website; Raskoti, 2009; Chen & Cribb, 2009). Flowering in Sikkim starts earlier and ends later, extending from June to October (Pearce & Cribb, 2002).

15. *Habenaria commelinifolia* (Roxb.) Wall. ex Lindl., Gen. Sp. Orchid. Pl.: 325. 1835; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883; Hooker, Fl. Brit. India 6: 143. 1890; Grant, Orchids Burma: 333. 1895; Seidenfaden & Smitinand, Orch. Thailand I: 41, fig. 31. 1959; Seidenfaden, Dansk Bot. Ark. 31(3): 89, fig. 51. 1977; Seidenfaden, Opera Bot. 114: 60. 1992; Chen & Cribb in Chen *et al.*, Fl. China 25: 154. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 32. 2009; Averyanov, Turczaninowia 13(2): 48, fig. 28. 2010; Kurzweil in Fl. Thailand 12(1): 95, fig. 50, pl. V-4. 2011.—*Orchis commelinifolia* Roxb., Fl. Ind. ed. 1832, 3: 451. 1832 [as *comelinæfolia*].—*Pecteilis commelinifolia* (Roxb.) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 51. 2018. Type: India, Bengal, icon. *Roxburgh 2334* (? syntype K!). Fig. 1E.

Terrestrial herbs, robust, 59–150 cm tall, glabrous except for the bract margins. *Underground*

tubers ellipsoid, 5–8 × 3–5 cm. *Stems* erect, stout. *Leaves* 3–7, cauline, scattered along the stem, lanceolate-oblong, mostly 7–18 × 1.3–2.5 cm, acuminate. *Inflorescences* lax, 7- to many-flowered; rachis mostly 9–16 cm long; floral bracts linear-lanceolate, mostly 19–37 × 2–4 mm, acuminate, margins ciliate. *Flowers* 18–20 mm in diameter, white or cream. *Pedicel and ovary* 30–70 mm long. *Sepals*: median sepal deeply hooded, broadly obovate or suborbicular, 5–7 × 6–11 mm, hood 4–5.5 mm deep, acute; lateral sepals spreading or reflexed, ovate, 11–15 × 7–9.5 mm, strongly oblique with the front margin a downwards-pointing false apex while the true apex is a few millimetres behind the base of the lateral sepal. *Petals* oblong-ovate, 5.2–7.2 × 3–4 mm, obtuse or acute. *Lip* over 30 mm long, deeply 3-lobed above the basal united base of 4–8 mm; midlobe linear, 22–37 mm long; side lobes linear, length as midlobe or slightly longer or shorter; spur cylindric, 50–80 mm long, distal part clavate. *Column* 2.5–4 mm long; anther erect with narrow connective, anther canals about 7 mm long, upwards-curved, pollinia ellipsoid, caudicles linear; stigma processes clavate.

Myanmar.—Upper Myanmar [9 Sept. 1894, *Prazer s.n.* (CAL [acc. no. 462336])]. Kachin State [Myitkyina District, Myitkyina Township, Sept. 1889, *Shaik Mokim 55* (CAL [acc. no. 462335 & 462332]); same locality, Sept. 1899, *Shaik Mokim 131* (K, P, CAL [acc. no. 462334])]. Shan State [Kengtung District, 915 m, July 1909, *MacGregor 6906* (E)]. Chin State [minor locality illegible, 1,525 m, *Daun 86* (K)]. Bago Region [Pyay District, 1826, *Wallich s.n.*, *Numer. List no. 7037B* (K-LINDL)]; Taungoo District, 16 Oct. 1925, *Ba Pe 1864* (CAL [acc. no. 462330])]. Kayah State [Loikaw District, 920 m, 9 Aug. 2018, *Tanaka et al. 3475* (TNS)]. Yangon Region [central part, 30 m, 5 Oct. 1948, *Po Khant 880* (K, RAF)]. Without locality [*Parish 227* (not located), fide Parish (1883: 201)]. [10 records]

Distribution.—India, Himalayas, Myanmar, northern Thailand, Vietnam and south-western China.

Ecology and phenology.—No habitat information is available in the collections from Myanmar; elevation ranges from 30 to 1,525 m. In other parts of the distribution area, the species is found in forested areas, frequently in grassy clearings in

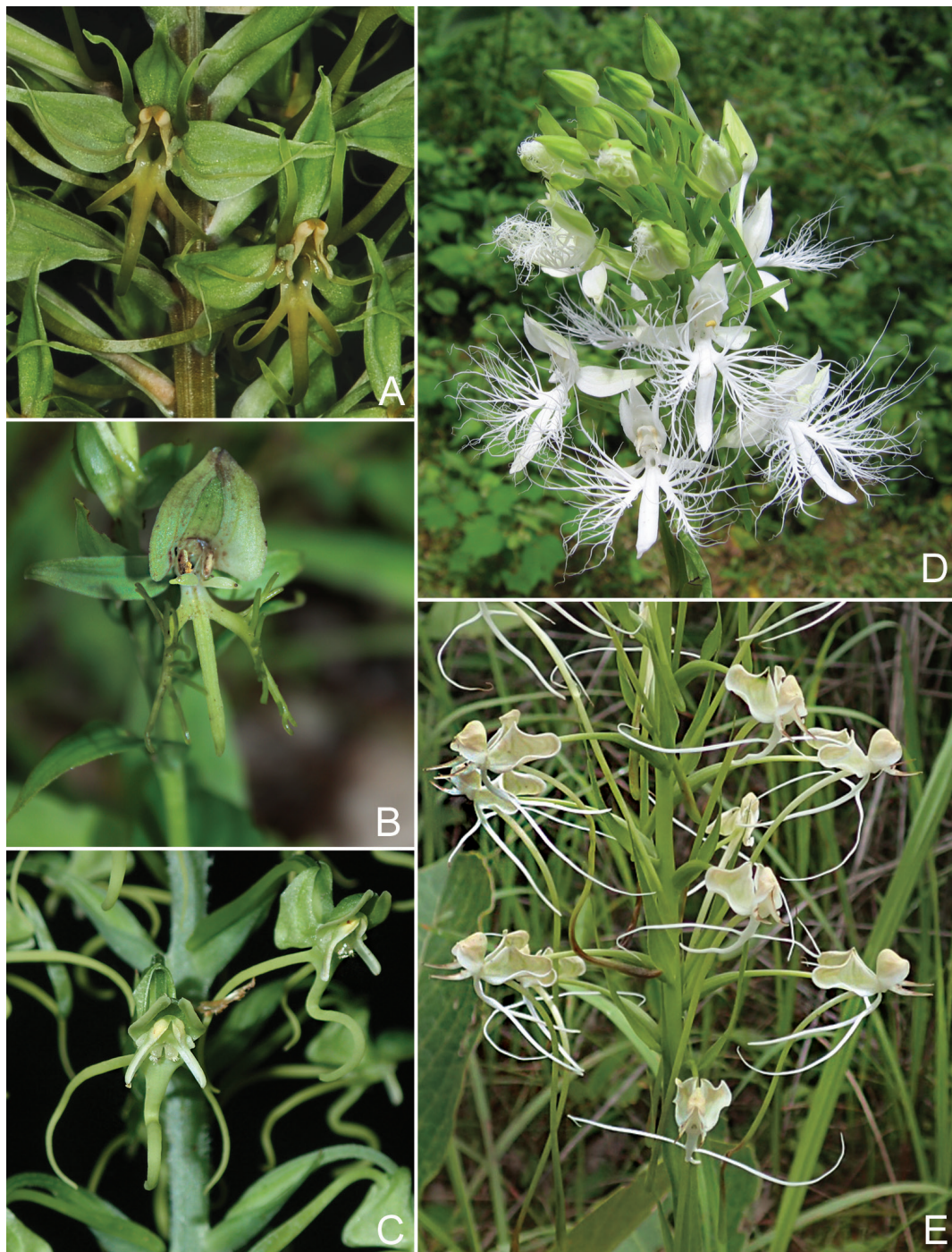


Figure 1. A. *Habenaria pantlingiana* Kraenzl.; B. *H. yuana* Tang & F.T.Wang; C. *H. reflexa* Blume; D. *H. trichosantha* Lindl.; E. *H. commelinifolia* (Roxb.) Wall. ex Lindl. Photos: A by Young-Dong Kim, B by Hubert Kurzweil, C–E by Nobuyuki Tanaka, D by Saw Lwin.

dipterocarp forest (Chen & Cribb, 2009; Kurzweil, 2009, 2011). Specimens from Myanmar are flowering mainly from July until October, which largely corresponds with northern Thailand and south-western China.

Notes.— The status of the type that we have cited above, ‘icon. *Roxburgh 2334*’, is contentious. It is certainly a type element, currently only known from an illustration; no specimen has yet been located. Extensive herbarium and library searches are required to determine whether a number of copies exist of the drawings, in which case the Kew illustration could be designated as a lectotype.

16. *Habenaria longithec* Seidenf., Dansk Bot. Ark. 31(3): 89, fig. 52. 1977; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 33. 2009; Kurzweil in Fl. Thailand 12(1): 117, fig. 65. 2011; Kurzweil, Thai J. Bot. 12: 29. 2020. Type: Thailand, Mae Hong Son Province, Doi Pa Khao west slope, 11 Aug. 1931, *Garrett 687* (holotype **K** [K000364323!, K000364324!, K000364325!]; isotype **BKF**!).

— *Habenaria kingii* auct., non Hook.f.: Seidenfaden & Smitinand, Orch. Thailand I: 35 pro parte. 1959.

Terrestrial herbs, robust, 57–65 cm tall. *Stems* terete, erect, lower part glabrous, upper part elongate-papillate with groups of branched hairs. *Leaves* 4–6, cauline, in a cluster in the lower stem half, broadly elliptic-lanceolate, mostly 8–22 × 3.5–6.5 cm, acuminate, glabrous. *Inflorescences* lax, 30–35-flowered; rachis 30–35 cm long; floral bracts lanceolate, as long as or shorter than pedicel and ovary, 18–34 × 5–7 mm, acuminate, margins ciliate. *Flowers* 20–22 mm in diameter, yellow-green. *Pedicel and ovary* cylindric-fusiform, 20–25 mm long, beaked, hairiness as upper stem part. *Sepals* subacute or obtuse; median sepal erect, forming a hood together with the petals, concave, suborbicular, 2.5–3 × ca 3 mm; lateral sepals recurved, obliquely ovate, with a false downwards-pointing apex while the true apex is a few millimetres behind the base of the lateral sepal, 11–14 × 4–6 mm, false apex broadly rounded, true apex obtuse. *Petals* falcately triangular, ca 3 × 1.7 mm, obtuse. *Lip* 28–32 mm long, deeply 3-lobed above a basal unlobed part 4–4.5 mm long, lobes linear; midlobe to 28 mm long, curled irregularly; side lobes 6.7–9.3 mm long; spur with wide basal part followed by a constriction and

a globular apex, 6–7 mm long. *Column* ca 2 mm long; anther canals 10–12 mm long; stigma processes short, globular.

Myanmar.— Shan State [Taunggyi District, 1,310 m, 28 July 2019, *Hervouet s.n.*, photographic record; same locality, 28 July 2019, *Buscail s.n.*, photographic record]. [2 records]

Distribution.— Eastern Myanmar and northern Thailand.

Ecology and phenology.— The habitat was not recorded in Myanmar; one photographic record comes from an elevation of about 1,310 m. In Thailand, the plants grow in evergreen forest at 960–1,550 m (Kurzweil, 2009, 2011). Plants from Myanmar were flowering in July; in neighbouring Thailand, flowering has been recorded in July and August.

17. *Habenaria reflexa* Blume, Bijdr. Fl. Ned. Ind.: 403. 1825; Holttum, Orch. Malaya: 84, figs. 14d. 1953; Seidenfaden & Smitinand, Orch. Thailand I: 35, fig. 25; IV(2): 727, pl. XXXII (3722). 1959–1965; Seidenfaden, Dansk Bot. Ark. 31(3): 92, fig. 54. 1977; Comber, Orch. Java: 64 (incl. colour photo). 1990; Seidenfaden & Wood, Orch. Penins. Malaysia Singapore: 111, fig. 47c–d, pl. 4b. 1992; Comber, Orch. Sumatra: 102 (incl. colour photo). 2001; Pearce & Cribb, Orch. Bhutan: 157. 2002; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 34, fig. 5. 2009; Averyanov, Turczaninowia 13(2): 50, fig. 29. 2010; Kurzweil in Fl. Thailand 12(1): 132, fig. 75. 2011.— *Pecteilis reflexa* (Blume) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 53. 2018. Type: Indonesia, Java, Kuripan, *Blume's collector s.n.* (holotype **L** [L0061372!]). Fig. 1C.

— *Habenaria murtonii* Hook.f., Fl. Brit. India 6: 144. 1890 [as *murtoni*]. Types: Malaysia, Perak, on limestone rocks, *Scortechini 552b* (syntype **K** [K000797000!]; isosyntype **CAL** [CAL0000000776!]); same locality, on limestone rocks, 4 Nov. 1885, *Kunstler s.n.* (syntype **CAL** [CAL0000000775!]).

— *Habenaria kingii* auct., non Hook.f.: Seidenfaden & Smitinand, Orch. Thailand I: 35 pro parte. 1959.

Terrestrial or lithophytic herbs, robust, 30–59 cm tall, lower part glabrous and upper part with papillae and prominent stout hairs. *Leaves* 3–6,

cauline, in a cluster in the lower part of the stem, lanceolate-elliptic, mostly $13\text{--}18 \times 2.5\text{--}4.4$ cm, acuminate, glabrous. *Inflorescences* lax, 10- to 25-flowered; rachis $8.5\text{--}25$ cm long, hairy; floral bracts lanceolate, shorter to slightly longer than pedicel plus ovary, $15\text{--}18 \times 4\text{--}6$ mm, margins ciliate, acuminate. *Flowers* $10\text{--}15$ mm in diameter, pale green or whitish. *Pedicel and ovary* narrowly cylindric-fusiform, $17\text{--}25$ mm long, with stout hairs and prominent papillae, neck narrow. *Sepals*: median sepal forming a hood together with the petals, erect, suborbicular, $3\text{--}5 \times 3\text{--}4$ mm, subacute or obtuse; lateral sepals recurved, obliquely triangular-ovate, strongly oblique with a subacute downwards-pointing false apex with the true apex close behind the point of insertion of the lateral sepal, $8\text{--}11 \times 4\text{--}4.5$ mm. *Petals* erect, broadly triangular, $2.5\text{--}4 \times 1.5\text{--}1.8$ mm, obtuse. *Lip* $10\text{--}15$ mm long, deeply 3-lobed above a united basal part $3.5\text{--}4$ mm long, lobes terete-linear; midlobe $6.5\text{--}16$ mm long, curved; side lobes $6.2\text{--}11$ mm long; spur cylindric, $15\text{--}18$ mm long, shorter than pedicel plus ovary, distal part clavate, strongly curved forwards. *Column* $1.5\text{--}3$ mm tall; anther canals $5\text{--}8$ mm long, straight, projecting forwards; stigma processes short, hemispheric. *Capsule* elliptic-fusiform, ca 25×3.7 mm, long beaked.

Myanmar.—Shan State [Taunggyi District, 3 Sept. 2016, *Kim s.n.*, photographic record]. Mandalay Region [Pyinoolwin District, 26 Aug. 2022, 960 m, *Tanaka MY5920* (**RAF**, **TNS**) (plant finished flowering); Myingyan District, 29 Sept. 2005, *Khin Myo Htwe 67* (**MBK** [s]), fide Tanaka *et al.* (2015: 81); same locality, Sept. 2005, *Kurzweil s.n.*, photographic record]. [4 records]

Distribution.—Myanmar, Thailand, Laos, Vietnam, Peninsular Malaysia, Sumatra, Java and Bali.

Ecology and phenology.—Habitat information in Myanmar is available only in one of the photographic records cited above where the plants grew in open forest; the elevation of 960 m has been recorded in one of the collections. In neighbouring Thailand and in Vietnam, *Habenaria reflexa* is found in evergreen or deciduous forest with dipterocarps and rattan at $125\text{--}1,200$ m (Kurzweil, 2009, 2011; Averyanov, 2010); plants have also been reported growing on limestone rocks. Flowering in Myanmar has been recorded in August and September; in

nearby countries in mainland Asia flowering occurs between July and November.

18. *Habenaria malleifera* Hook.f., Fl. Brit. India 6: 143. 1890; Seidenfaden, Dansk Bot. Ark. 31(3): 95, fig. 57. 1977; Pearce & Cribb, Orch. Bhutan: 149. 2002; Averyanov, Turczaninowia 13(2): 50, figs. 30 & 34h. 2010. Types: India, Khasia, *Lobb s.n.* (lectotype **K-LINDL** [K000247442!], designated by Seidenfaden, 1977; isolectotype **K!**). Syntypes: India, Darjeeling, Senadah, *King s.n.* (**CAL**); India, Khasia, Myrung, *Hooker & Thomson 257* (**K-LINDL** [K000873762!]; isosyntype **K** [K000247441!]).

—*Habenaria furfuracea* Hook.f., Fl. Brit. India 6: 144. 1890. Type: India, Khasia, Nunklov, *Hooker & Thomson 1798* (holotype **K** [K000387581!]).

Terrestrial herbs, robust, $30\text{--}90$ cm tall. *Underground tubers* globose to fusiform, $1\text{--}6 \times 1\text{--}1.8$ cm. *Stems* stout, erect, upper part scurfy or hairy. *Leaves* $3\text{--}6$, cauline in the lower half of the stem, broadly oblanceolate or elliptic, $7\text{--}25 \times 2.5\text{--}8$ cm, acute. *Inflorescences* lax, many-flowered; rachis $8\text{--}30$ cm long; floral bracts lanceolate, shorter or longer than pedicel plus ovary, $12\text{--}25 \times 3\text{--}6$ mm, pubescent on the margins. *Flowers* $12\text{--}20$ mm in diameter, whitish-green or green. *Pedicel and ovary* cylindric, $18\text{--}24$ mm long, beaked, hairy on the ridges. *Sepals*: median sepal forming a hood together with the petals, concave, broadly orbicular, $6\text{--}7 \times 4.5\text{--}7$ mm, subacute; lateral sepals reflexed, obliquely triangular-oblong, their front margin broadly rounded, $6\text{--}8 \times 4.5\text{--}6$ mm, subacute or obtuse. *Petals* oblong, falcate, $2\text{--}6 \times 1\text{--}2$ mm. *Lip* 3-lobed from near the base, lobes linear or filiform; midlobe $10\text{--}14$ mm long; side lobes $12\text{--}18$ ($\text{--}20$) mm long; spur cylindric, curved, $10\text{--}20$ mm long, shorter than pedicel plus ovary, apex clavate-globose. *Column* $2.8\text{--}5$ mm long; anther reflexed, anther canals about 3 mm long, pollinia ovoid, much shorter than the linear caudicles; stigma processes spherical.

Myanmar.—Kachin State [Myitkyina District, minor locality not traced, 610 m, 4 Aug. 1939, *Kaulback 311* (**BM**)]. [1 record]

Distribution.—Himalayas, north-eastern India, northern Myanmar and Vietnam.

Ecology and phenology.—In Myanmar collected at an elevation of 610 m; the habitat is not

known. In Vietnam, the species is found in broad-leaved evergreen forest over limestone at 50–900 m (Averyanov, 2010). Bhutanese plants occur at higher elevations of 1,520 to 1,830 m (Pearce & Cribb, 2002). The single collection from Myanmar was found in flower in August; in nearby countries, flowering has been recorded in August and September (north-eastern India: Pearce & Cribb, 2002; Vietnam: Averyanov, 2010).

19. *Habenaria spatulifolia* C.S.P. Parish & Rehb. f., Trans. Linn. Soc. London 30: 140. 1874 [as *spatulæfolia*]; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883; Hooker, Fl. Brit. India 6: 145. 1890; Grant, Orchids Burma: 342. 1895 [as *spatulæfolia*]; Seidenfaden, Dansk Bot. Ark. 31(3): 98, fig. 59. 1977. Type: Myanmar, Kayin State, Hpa-An District, *Parish 217* (holotype **K** [K000247445], as *spatulæfolia*). Fig. 2B.

Slender herbs, apparently terrestrial or lithophytic, about 16 cm tall. *Stems* erect. *Leaves* 2–3, subradical, erect or suberect, nearly as long as the stem, oblong-spatulate, 7–12.7 × 2.1–3 cm, broadly rounded and acute. *Inflorescences* slender, 1–2-flowered, about as long as the leaves; floral bracts ovate, much shorter than pedicel plus ovary, ca 11 × 5 mm, acute. *Flowers* ca 17 mm in diameter, colour not known. *Pedicel and ovary* narrowly cylindric, straight, ca 26 mm long, with a long apical beak. *Sepals* subacute or acute; median sepal forming a hood together with the petals, concave, ovate, ca 12.7 mm long; lateral sepals deflexed, hyaline, strongly oblique, their front margin broadly rounded, ovate, similar in length as the median sepal. *Petals* unlobed, ligulate-falcate, as long as the sepals, subacute. *Lip* ca 20 mm long, deeply 3-lobed above an unlobed basal part, lobes linear; spur cylindric, ca 35 mm long, longer than pedicel plus ovary, distally clavate, forwards-curved. *Column*: anther 5 mm long, reflexed, anther canals about 5 mm long, straight projecting forwards; stigma processes ca 1 mm long, much shorter than the anther canals, central rostellum lobe short, erect, freely protruding.

Myanmar.—Kayin State [Hpa-An District, *Parish 217* (holotype **K**)]. [1 record]

Distribution.—Endemic; so far only known from the type collection.

Ecology and phenology.—Not recorded.

Notes.—According to the herbarium label the type specimen comes from ‘Zwakabin’ which is what is now called ‘Mount Zwegabin’ near Hpa-an in Kayin State in the south of the country. However, Hooker (1890) gives the locality erroneously as ‘Mergui’ (now Myeik) which is in a different part of southern Myanmar.

The correct generic placement of this species is not certain as indicated by striking similarities with the genus *Diplomeris*. A faint hand-written note on the type sheet appears to say ‘cf. *Diplomeris*’. Seidenfaden (1977) pointed out that the species has a column with a freely-projecting central rostellum lobe which is another *Diplomeris* character. The recurved, hyaline and strongly oblique lateral sepals are reminiscent of the *Habenaria reflexa* group; this is where Hooker (1890) places this species while noting that it has the habit of *Diplomeris*. Further research in order to clarify the situation is needed.

20. *Habenaria dentata* (Sw.) Schltr., Repert. Spec. Nov. Regni Veg. Beih. 4: 125. 1919; Seidenfaden & Smitinand, Orch. Thailand I: 39, fig. 28–29; IV(2): 727. 1959–1965; Seidenfaden, Dansk Bot. Ark. 31(3): 98, fig. 60. 1977; Seidenfaden, Opera Bot. 114: 61, pl. IVc. 1992; Seidenfaden & Wood, Orch. Penins. Malaysia Singapore: 113, fig. 47e–g, pl. 4c. 1992; Pearce & Cribb, Orch. Bhutan: 148. 2002; Chen & Cribb in Chen *et al.*, Fl. China 25: 157. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 39, fig. 7. 2009; Raskoti, Orch. Nepal: 153 (incl. colour photos). 2009; Averyanov, Turczaninowia 13(2): 67, figs. 43 & 58e–f. 2010; Chen *et al.*, Fl. China 25, Illustrations: figs. 202.2 & 207. 2010; Barretto *et al.*, Wild Orch. Hong Kong: 246, figs. 205–208. 2011; Kurzweil in Fl. Thailand 12(1): 98, fig. 52, pl. VI-1. 2011.—*Orchis dentata* Sw., Kongl. Vetensk. Acad. Nya Handl. 21: 207. 1800.—*Platanthera dentata* (Sw.) Lindl., Gen. Sp. Orchid. Pl.: 296. 1835.—*Plantaginorchis dentata* (Sw.) Szlach., Richardiana 4: 64. 2004.—*Pecteilis dentata* (Sw.) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 51. 2018. Type: China, ? *Alnoor* (as *Alnor*) s.n. (**S!**). Fig. 3A–C.

—*Habenaria geniculata* D.Don, Prodr. Fl. Nepal.: 25. 1825; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883; Hooker,

Fl. Brit. India 6: 138. 1890; Grant, Orchids Burma: 336. 1895.— *Orchis geniculata* Buch.-Ham. ex D.Don, Prodr. Fl. Nepal.: 25. 1825, **pro syn.** Type: Nepal, Sept., *Buchanan-Hamilton s.n.* (not found).

— *Thelymitra malintana* Blanco, Fl. Filip.: 642. 1837.— *Habenaria malintana* (Blanco) Merr., Sp. Blancoan.: 112. 1918; Seidenfaden & Smitinand, Orch. Thailand I: 22, fig. 13; IV(2): 725. 1959–1965; Seidenfaden, Dansk Bot. Ark. 31(3): 126, fig. 79. 1977; Seidenfaden, Opera Bot. 114: 67. 1992; Chen & Cribb in Chen *et al.* (eds), Fl. China 25: 157. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 43, fig. 8. 2009; Averyanov, Turczaninowia 13(2): 57, fig. 39. 2010; Chen *et al.*, Fl. China 25, Illustrations: fig. 214.5. 2010; Kurzweil in Fl. Thailand 12(1): 121, fig. 67, pl. VIII-4. 2011.— *Kraenzlinorchis malintana* (Blanco) Szlach., Orchidee (Hamburg) 55: 58. 2004.— *Pecteilis malintana* (Blanco) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 52. 2018. Type: Philippines, Malinta, near Manila, ? *Blanco s.n.* (not found).

— *Habenaria pelorioides* C.S.P.Parish & Rchb.f., Trans. Linn. Soc. London 30: 139, pl. XXVII-A. 1874; Parish in Mason, Burma – People and Productions, vol. II (Botany): 200. 1883; Hooker, Fl. Brit. India 6: 166. 1890; Grant, Orchids Burma: 340. 1895. Type: Myanmar, Mon State, Mawlamyine District, Amherst, seaside, 1862, *Parish 327* (holotype **W-R** 1817!; isotype **K** [K000247491!]).

— *Habenaria geniculata* D.Don var. *ecalcarata* King & Pantl., Ann. Roy. Bot. Gard. (Calcutta) 8: 310. 1898.— *H. dentata* (Sw.) Schltr. var. *ecalcarata* (King & Pantl.) Hand.-Mazz., Symb. Sin. 7: 1336. 1936.— *H. dentata* (Sw.) Schltr. f. *ecalcarata* (King & Pantl.) Tuyama, Fl. E. Himal.: 438. 1966.— *H. dentata* (Sw.) Schltr. subsp. *ecalcarata* (King & Pantl.) Panigrahi & Murti, Fl. Bilaspur Distr. 2: 589. 1999. Type: ? *Pantling s.n.* (**CAL**).

— *Habenaria parageniculata* Tang & F.T.Wang, Bull. Fan Mem. Inst. Biol. 7: 137. 1936; Averyanov, Turczaninowia 13(2): 57, figs. 40 & 58c–d. 2010.— *H. dentata* (Sw.) Schltr. var. *parageniculata* (Tang & F.T.Wang) Aver., Turczaninowia 9: 67. 2006.— *Pecteilis parageniculata* (Tang & F.T.Wang) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 53. 2018. Type: Myanmar, Kayah State, Loikaw District, Salween Valley, Ywathit, 24 Dec. 1912, *Micholitz s.n.* (holotype **K** [K000247490!]).

— *Odisha cleistantha* S.Misra, Orchids India: 252. 2007. Type: India, Orissa State, Mayurbhanj District, Similipal Forest, near Gudugudia, 600 m, 27 Sept. 2004, *Misra 2434* (holotype **CAL**).

— *Habenaria luceana* Aver., Taiwania 55: 95. 2010. Type: Vietnam, Dac Lac Province, Buon Don District, in open dry dipterocarp forest and woodland, 200 m, 27 Mar. 2008, *Hiep et al. HLF 7407b* (holotype **HN**; isotype **LE**).

Terrestrial herbs, mostly robust, 26–101 cm tall, glabrous except bracts often stiff-hairy on the margins, and sepal and petal margins mostly minutely denticulate. *Underground tubers* ellipsoid to oblong, 2–5 × 1–3 cm. *Stems* terete, erect, stout. *Leaves* 2–7, cauline, scattered in the lower half of the stem, oblong, oblong-lanceolate or narrowly elliptic, 5–20 × 1–4.5 cm, acute. *Inflorescences* lax, semi-dense or dense, 10- to many-flowered; rachis mostly 4–9.5 cm long; floral bracts narrowly lanceolate, 10–33 × 1–6 mm, acute. *Flowers* 13–29 mm in diameter, white, in peloric forms flowers often not opening fully; reported as scented or odourless. *Pedicel and ovary* cylindric-fusiform, 15–30 mm long, sometimes with narrow beak. *Sepals* similar, ovate-lanceolate, acute or subacute; median sepal erect, usually forming a hood together with the petals, concave, 7–17 × 4–9 mm; lateral sepals reflexed or spreading, somewhat oblique, mostly 7.5–18 × 3.4–5.5 mm. *Petals* almost always unlobed, narrowly and falcately oblong-lanceolate or ligulate, mostly 5–11.5 × 1.7–3 mm, acute; very rarely shallowly bilobed with large triangular anterior lobe and small tooth-like posterior lobe. *Lip* very variable in shape, 3-lobed or more rarely unlobed in peloric forms, broadly obovate to ligulate-lanceolate, 9–25 mm long, forms with side lobes with a narrow claw 2–7 mm long, with a prominent or insignificant collar in front of the spur entrance; midlobe ligulate-lanceolate, oblong or linear-lanceolate, 5–22 × 0.7–3 mm, acute or subacute; side lobes (if present) sub-rhombic or flabellate, mostly 2.9–15 × 1–10 mm, mostly serrate or dentate; spur present or in peloric forms very short or absent, if present cylindric, up to 50 mm long, usually geniculate, distally clavate, obtuse. *Column* 2.5–5 mm long; anther with narrow connective, anther canals 1–3 mm long and slightly curved upwards; auricles small; stigma processes oblong, 2.3–3 mm long. *Capsule* elliptic-fusiform, 19–26.9 × 3–5.4 mm, with a beak.

Myanmar.— Upper Myanmar [Nov. 1897, *Shaik Mokim s.n.* (CAL [acc. no. 462182 & 462183]); Oct. 1889, *King s.n.* [? *King's collector*] (K)]. Kachin State [Myitkyina District, Chipwi Township, 1,525 m, 9 Oct. 1919, *Farrer 1392* (E)]. Sagaing Region [Katha District, Nov. 1908, *Lace s.n.* (E) (peloric form); same locality, *without collector s.n.* (E) (peloric form)]. Shan State [Taunggyi District, *Abdul Khalil s.n.* (CAL [acc. no. 462185]); same locality, *Collett 968* (CAL [acc. no. 462186 & 462189]); same locality, 915–1,220 m, 18 Oct. 1911, *Robertson 440* (K); same locality, 885 m, 25 Oct. 1939, *Dickason 9037* (AMES); Kengtung District, 1,370 m, Sept. 1909, *MacGregor 815* (E), identification uncertain; southern part, 1893, *Abdul Khalil s.n.* (CAL [acc. no. 462184]); same locality, 1910, *Robertson 34* (K) (peloric form); same locality, *without collector s.n.* (E) (peloric form)]. Mandalay Region [Pyinoolwin District, 1,065 m, 27 Oct. 1907, *Bogg BG 18* (K); same locality, 1,065 m, 11 Oct. 1908, *Lace 4322* (CAL [acc. no. 462187], E); same locality, 1,065 m, 11 Oct. 1908, *Lace 4322* (K) (peloric form); same locality, 1,065 m, Oct. 1909, *Lace s.n.* (E); same locality, 1,065 m, Sept. 1911, *Lace s.n.* (E); same locality, 1,065 m, Oct. 1911, *Lace s.n.* (E); same locality, 1,525 m, Oct. 1912, *Lace s.n.* (E); same locality, 915–1,065 m, Oct. 1914 and 1915, *Rodger 226* (CAL [acc. no. 462181]); same locality, 365 m, Oct. 1915, *Smith 77* (AMES); same locality, 30 Oct. 1927, *Badal 4800* (CAL); same locality, 1,065 m, *Bogg s.n.* in *Maymyo Bot. Gard. 13542* (K); Kyaukse District, *Wallich s.n.*, *Numer. List no. 7042 pro parte* (K); Myingyan District, 25 Oct. 2000, *Tanaka et al. 020764* (MBK), fide *Tanaka et al.* (2015: 81) (peloric form); same locality, 16 Nov. 2005, *Khin Myo Htwe 71* (MBK [s], TNS), fide *Tanaka et al.* (2015: 80); same locality, Nov. 2010, *Saw Lwin et al. MPO 034* (SING) (peloric form); Meiktila District, 1,065 m, 23 Oct. 1936, *Smith 16288* (K)]. Border Magway Region and Chin State (Gangaw and Mindat districts) [1,000 m, 25 Oct. 2011, *Ling Shein Man 087681 & 087681B* (MBK); same date and locality, *Ling Shein Man 087681A* (MBK) (peloric form)]. Chin State [Falang District, 1,645 m, *Daun 83* (K) (peloric form); same locality, 1,645 m, *Daun 87* (K); Mindat District, 1,370 m, 15 Sept. 1956, *Maung Gale-2 5785 pro parte* (RAF); same locality, 1,295 m, 27 Sept. 1956, *Kingdon-Ward 22707* (BM); same locality, 4 Nov. 2002, *Ling Shing Maung & Cho Cho Win 024433* (MBK); same locality, 700–800 m, 4

Dec. 2002, *Murata et al. 024629* (MBK); same locality, 750–1,200 m, 5 Dec. 2002, *Murata et al. 025577* (MBK); same locality, 1,150–1,200 m, 6 Dec. 2002, *Murata et al. 025620* (MBK); same locality, 1,140 m, 9 Oct. 2008, *Yasuda 053818* (MBK); same locality, 1,500 m, 12 Oct. 2008, *Yasuda 053638* (MBK); same locality, 1,500 m, 12 Oct. 2008, *Yasuda 053638A* (MBK) (peloric form); same locality, 1,200 m, 21 Oct. 2008, *Om Ling Htan 053642* (MBK); same locality, 22 Oct. 2011, *Law Shein 088249* (MBK); same locality, 1,500 m, 4 Sept. 2012, *Ling Shein Man 091676* (MBK); same locality, 1,250 m, 13 Jan. 2013, *Ling Shein Mang 096179* (MBK); district not known, *Daun 84* (K) (peloric form); 1,980 m, 30 Sept. 1910, *Venning 34* (K)]. Bago Region [Pyay District, 1826, *Wallich s.n.*, *Numer. List no. 7042 pro parte* (K)]. Kayah State [Loikaw District, *Micholitz s.n.* (holotype of *Habenaria parageniculata* Tang & F.T.Wang K); same locality, 1,240 m, 8 Aug. 2018, *Tanaka et al. 3464* (TNS)]. Mon State [Mawlamyine District, *Parish 327* (holotype of *Habenaria pelorioides* C.S.P.Parish & Rech.f. W-R; isotype K) (peloric form)]. Tanintharyi Region [Dawei District, 245 m, Sept. 1961, *Keenan et al. 1582* (A, E) (peloric form); Myeik District, 21 Nov. 1890, *Prazer s.n.* (CAL [acc. no. 462188])). Without locality [*Parish 226* (not located), fide *Parish* (1883: 201; as *H. geniculata*); 305 m, July 1893, *Boxall s.n.* (K); July 1898, *Boxall s.n.* (SING); 1916, *Rodger 648* (E)]. [58 records]

Suspected hybrids with *Habenaria trichosantha* Lindl.: Mandalay Region [Myingyan District, 25 Oct. 2000, *Murata et al. 020761* (MBK, 2 sheets); same locality, Oct. 2009, *Saw Lwin et al. s.n.*, photographic record; same locality, 29 Oct. 2013, *Kim s.n.*, photographic record]. [3 records] Fig. 3D.

Distribution.— Northern India, Himalayas, Bhutan, Myanmar, Thailand, Laos, Vietnam, Cambodia, China, Taiwan, Japan, Korea, Peninsular Malaysia and Philippines.

Ecology and phenology.— Throughout its distribution area, *Habenaria dentata* grows in a wide variety of habitats including grassland, bracken, bamboo thicket, broad-leaved thicket and forested habitats (see the Myanmar specimens examined here; Pearce & Cribb, 2002; Chen & Cribb, 2009; Kurzweil, 2009, 2011; Raskoti, 2009; Averyanov, 2010). The forested habitats include deciduous, semi-evergreen and evergreen forest, oak forest, pine

forest and fruit plantations. *Habenaria dentata* is often also found in disturbed habitats, such as roadsides or secondary forests. Collector's notes regarding the underlying rock were not made in the specimens from Myanmar; in neighbouring Thailand granite, shale, sandstone, limestone and phyllite are given as bedrock (Kurzweil, 2009, 2011). Elevation ranges from near sea level to 2,300 m. In Myanmar, this species is flowering mostly between September and December. There are a few exceptions; the specimen *Ling Shein Mang 096179* was flowering in the middle of January and two unnumbered *Boxall* collections at **K** and **SING** were made in July. In nearby countries, the flowering time of the species is similar, and there are also occasional reports of flowering as early as July and August or as late as January.

Notes.— This is the most common *Habenaria* species in Myanmar. As also in other countries it is very variable in the degree of its lip lobing and the length of its spur. Some of the variation of the lip shape was illustrated by Seidenfaden & Smitinand in several Thai specimens (1959: 39, fig. 28). While a typical *H. dentata* form (3-lobed lip with dentate side lobes, prominent spur up to 50 mm long) is clearly distinct from a typical *H. malintana* form (unlobed lip, spur absent), there are also numerous intermediate forms with small or obscure lip side lobes and short spurs, and we therefore consider *H. malintana* merely as a peloric form of *H. dentata*. Another form, with deeply dissected lip side lobes is here interpreted as a hybrid between *H. dentata* and *H. trichosantha*, following a suggestion by the second author of this paper. The hybrid is known from a single collection and two photographic records, all of them from Mount Popa in Mandalay Region in central Myanmar.

21. *Habenaria shweliensis* W.W.Sm. & Banerji, Rec. Bot. Surv. India 6: 33. 1913. Type: Myanmar, Shan State, Kyaukme District, Shweli Valley, Sept. 1910, *Rodger 387* (holotype **CAL** [CAL0000000740!]; isotype **K** [K000827005!]). Fig. 2C & 4A.

— non *Habenaria shweliensis* auct. W.W.Sm. & Banerji: Chen & Cribb in Chen *et al.*, Fl. China 25: 158. 2009 [= *H. crassilabia* Kraenzl.].

Terrestrial herbs, 20–60 cm tall, glabrous. *Stems* terete, erect, stout. *Leaves* 5–7, cauline, in a cluster in the lower quarter of the stem, lanceolate

or elliptic-lanceolate, 4.8–10 × 1.8–3 cm, acute. *Inflorescences* lax, 13–25-flowered; rachis 7–17 cm long; floral bracts ovate-lanceolate, shorter than pedicel plus ovary, 5–9 mm long, long-acuminate. *Flowers* ca 8 mm in diameter, green, lip sometimes yellow. *Pedicel and ovary* linear, ca 12 mm long. *Sepals* obtuse; median sepal forming a hood together with the petals, concave, ovate to orbicular, 2.7–3 × ca 2.5 mm; lateral sepals spreading or reflexed, elliptic, ca 2.9 × 2 mm. *Petals* ovate, size similar to the sepals, truncate or obtuse. *Lip* ca 4 mm long, deeply 3-lobed, lobes loriform; midlobe erect, adnate to the tip of the hood formed by the median sepal and the petals, ca 2.8 mm long; side lobes slightly longer; spur cylindric, 3–6 mm long, much shorter than pedicel plus ovary, strongly clavate. *Column* ca 1.5 mm long; anther reflexed.

Myanmar.— Shan State [Kyaukme District, *Rodger 387* (holotype **CAL**; isotype **K**); Taunggyi District, 18 Aug. 2018, *Kim s.n.*, photographic record; same locality, 25 July 2019, 1,215–1,380 m, *Hervouet s.n.*, photographic record; Loilen District, 1,370 m, 25 July 1911, *Robertson 381* (**K**)]. Mandalay Region [Pyinoolwin District, July 1912, *Lace s.n.* (**E**), identification uncertain; Myingyan District, 12 Aug. 2011, *Kim s.n.*, photographic record]. [6 records]

Distribution.— Endemic to central and eastern Myanmar.

Ecology and phenology.— Habitat information is available in a single collection which was made in tall grass on limestone soil at 1,370 m. An elevation of between 1,215 and 1,380 m was reported in a photographic record. Flowering has been recorded between July and September.

Notes.— Very similar to *Habenaria lucida* Wall. ex Lindl. The main difference between the two species is the lip spur which is strongly clavate, 3–6 mm long and much shorter than pedicel plus ovary in *H. shweliensis*, but slender cylindric, 16–25 mm long and longer than pedicel plus ovary in *H. lucida*. Further differences are the smaller leaves, floral bracts and flowers of *H. shweliensis*.

22. *Habenaria lucida* Wall. ex Lindl., Gen. Sp. Orchid. Pl.: 319. 1835; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883; Hooker, Fl. Brit. India 6: 133. 1890; Grant,

Orchids Burma: 338. 1895; Seidenfaden, Dansk Bot. Ark. 31(3): 102, fig. 62. 1977; Seidenfaden, Opera Bot. 114: 63. 1992; Chen & Cribb in Chen *et al.*, Fl. China 25: 158. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 49, fig. 10. 2009; Averyanov, Turczaninowia 13(2): 70, fig. 45. 2010; Chen *et al.*, Fl. China 25, Illustrations: fig. 210.6–9. 2010; Kurzweil in Fl. Thailand 12(1): 119, fig. 66, pl. VIII-3. 2011.— *H. dilatata* (Pursh) Hook. subsp. *lucida* (Wall. ex Lindl.) S.S.Ying, Coloured Illustr. Orchid Fl. Taiwan 2: 217. 1990.— *Platantheroides lucida* (Wall. ex Lindl.) Szlach., Richardiana 4: 107. 2004.— *Habenella lucida* (Wall. ex Lindl.) Szlach. & Kras-Lap., Richardiana 6: 37. 2006.— *Pecteilis lucida* (Wall. ex Lindl.) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 52. 2018. Type: Myanmar, Yangon Region, 1826, *Wallich s.n.*, Numer. List no. 7047 (holotype **K!**). Fig. 4D.

— *Habenaria recurva* Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 420. 1925; Seidenfaden & Smitinand, Orch. Thailand I: 33, fig. 23, pl. II (2656); IV(2): 727. 1959–1965. Type: Thailand, Chiang Mai Province, Doi Suthep, in mixed jungle, 1,800 ft, 19 Aug. 1909, *Kerr 190* (holotype **K** [K000364320!]; isotypes **L** [L0114893!], **P** [P00411406!]).

— *Habenaria recurva* Rolfe ex Downie var. *erectiflora* Tang & F.T.Wang, Bull. Fan Mem. Inst. Biol., Bot. 10: 41. 1940. Type: China, Yunnan, Che-li Hsien, 700 m, Aug. 1936, *Wang 75464* (holotype not found; isotypes **PE** [PE00340327, PE00340328], **WUK** [WUK0041382], **NAS** [NAS00558363]).

Terrestrial herbs, slender or robust, 28–75 cm tall, glabrous except bracts sometimes marginally ciliate. *Underground tubers* ellipsoid or oblong, 3–5 × 1–3 cm. *Stems* terete, erect. *Leaves* 2–6, cauline, in a cluster in the lower part of the stem, elliptic-lanceolate or subspathulate, mostly 6–27 × 5–6.7 cm, obtuse or acute. *Inflorescences* semi-dense or lax, many-flowered; rachis 11–37 cm long; floral bracts ovate-lanceolate or lanceolate, shorter or longer than pedicel plus ovary, 11–23 × 2–5 mm, acuminate. *Flowers* 9–15 mm in diameter, green or yellow-green. *Pedicel and ovary* cylindric, 15–20 mm long. *Sepals* obtuse; median sepal forming a hood together with the petals, erect, concave, ovate, mostly 3.5–5.1 × 2.7–4 mm; lateral sepals reflexed, elliptic-oblong, 4–6 × 1.7–3.5 mm. *Petals* triangular-oblong, 3.3–4.5 × 1.5–2.8 mm, truncate or obtuse. *Lip* 4–6 mm long, deeply 3-lobed from near the base, lobes oblong,

fleshy; midlobe 3.5–6 mm long, curved upwards and adnate to the hood made up of the petals and the median sepal; side lobes reflexed, 3.5–8 mm long; spur cylindric, 16–25 mm long, slender, longer than pedicel plus ovary. *Column* 2.3–3 mm long; anther erect or suberect, with narrow connective, anther canals very short, pollinia ovoid; stigma processes stout.

Myanmar.— Mandalay Region [Myingyan District, 10 Sept. 2005, *Khin Myo Htwe 61* (**TNS** [s]), fide Tanaka *et al.* (2015: 81)]. Chin State [Mindat District, 7 Aug. 2016, *Kim s.n.*, photographic record]. Yangon Region [central part, 30 m, 18 Aug. 1948, *Po Khant 661* (**RAF**); same locality, 30 m, 15 Sept. 1948, *Po Khant 835* (**K**, **RAF**); district not known, *Wallich s.n.*, Numer. List no. 7047 (holotype **K**); 27 Sept. 1972, *Thein Pe s.n.* (**K**)]. Mon State [Mawlamyine District, *Parish 110* (**K**, **W**)]. [7 records]

Distribution.— Myanmar, Thailand, Laos, Vietnam, Cambodia, southern and south-western China and Taiwan.

Ecology and phenology.— In Myanmar reported in dry forest at low elevation. In Thailand and China, the species has been reported in broad-leaved deciduous and rarely in evergreen forest and bamboo forest, sometimes in slightly disturbed sites (Chen & Cribb, 2009; Kurzweil, 2009, 2011). The plants grow at elevations of 50–1,300 m. In Thailand shale and limestone have been indicated as bedrock. Flowering in Myanmar occurs in August and September; in other parts of the distribution area similar but starting already in June or July and sometimes extending to November.

Notes.— The location of the holotype of the conspecific *Habenaria recurva* var. *erectiflora* is uncertain, but there are four known isotypes (see above).

23. *Habenaria chlorina* C.S.P.Parish & Rehb.f., Trans. Linn. Soc. London 30: 140. 1874; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883 [as *chlorantha*]; Hooker, Fl. Brit. India 6: 147, 197. 1890; Grant, Orchids Burma: 332. 1895; Seidenfaden & Smitinand, Orch. Thailand I: 28, fig. 18; IV(2): 726. 1959–1965; Seidenfaden, Dansk Bot. Ark. 31(3): 106, fig. 63. 1977; Seidenfaden, Opera Bot. 114: 63. 1992; Kurzweil, Thai Forest

Bull., Bot. (Special Issue): 54, fig. 12. 2009; Kurzweil in Fl. Thailand 12(1): 90, fig. 48, pl. V-3. 2011. Type: Myanmar, Mon State, Mawlamyine District, 1 Nov. 1860, *Parish 245* (lectotype **K** [K000247451!, K000247452!, designated by Clayton, 2017]; icon. **W-R** 11143!). Syntypes: same locality, *Parish 218* (**K**!); same locality, *Parish 124* (**K** [K000247453!]). Fig. 4C.

Terrestrial herbs, slender or robust, 12–30 cm tall, largely glabrous but sterile bracts and floral bracts sometimes stiff-hairy on the margins. *Leaves* 3–5, cauline in the lower half of the stem, lanceolate-oblong, 4–17 × 0.4–1.1 cm, acute. *Inflorescences* semi-dense or lax, 6–30-flowered; rachis mostly 2–8 cm long; floral bracts lanceolate, slightly longer than pedicel plus ovary, 11–17 × 1–2.5 mm, acute. *Flowers* 8–10 mm in diameter, yellow, greenish-yellow or brownish-yellow. *Pedicel and ovary* 10–15 mm long. *Sepals*: median sepal erect, concave, ovate, forming a hood together with the petals, 3.6–5 × 2.5–3.5 mm; lateral sepals spreading, oblong-ovate, 4–6 × 2.6–3.9 mm. *Petals* oblong-ovate, 3.7–5.5 × 1.2–2.4 mm, obtuse. *Lip* 4–7 × 1.5–1.7 mm, 3-lobed to the base, without a collar in front of the spur entrance; midlobe oblong, 4.2–5.8 mm long; side lobes subulate, 2–3.8 mm long; spur cylindric, 8–10.8 mm long, distal third clavate. *Column* 2–3 mm long; anther erect with narrow connective, anther canals 1–1.5 mm long, pollinia narrowly ellipsoid, shorter than the linear caudicles; stigma processes 1.5–1.8 mm long.

Myanmar.— Shan State [Taunggyi District, 1,565 m, 19 Sept. 2015, *Baba et al. m-589* (**MBK**); same locality, 1,440 m, 29 July 2019, *Hervouet s.n.*, photographic record; district not known, 1,340 m, *Collett s.n.* (not located, possibly **CAL**), fide Hooker (1890: 147); *Saw Lwin s.n.*, photographic record]. Kayah State [Loikaw District, 1893, *Abdul Khalil s.n.* (**CAL** [acc. no. 462381])]. Yangon Region [central part, 30 m, 19 Sept. 1948, *Po Khant 847* (**K, RAF**)]. Mon State [Mawlamyine District, *Lobb s.n.* (**K**); same locality, *Parish 124* (syntype **K**); same locality, *Parish 218* (syntype **K**); same locality, *Parish 245* (lectotype **K**; icon. **W-R**)]. [10 records]

Distribution.— Myanmar, northern Thailand and Laos; possibly also south-western China.

Ecology and phenology.— Habitat notes are available in a single collection from Myanmar, which is ‘dry forest’. In addition, photographs from Shan

State were seen by the first author of this paper, where *Habenaria chlorina* was growing in grassland interspersed with low bushes. Elevations in Myanmar range from 30 to 1,565 m. In neighbouring Thailand, the species is found in dipterocarp, oak and pine forest, often over granite, from 350–1,300 m (Kurzweil, 2009, 2011). In Myanmar, flowering of *H. chlorina* occurs from the end of July to the beginning of November, which largely corresponds with the flowering time in Thailand.

24. *Habenaria acuifera* Wall. ex Lindl., Gen. Sp. Orchid. Pl.: 325. 1835; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883; Hooker, Fl. Brit. India 6: 146. 1890; Grant, Orchids Burma: 330. 1895; Seidenfaden & Smitinand, Orch. Thailand I: 35. 1959 [as ‘*H. acuifera-roseata* group’]; Seidenfaden, Dansk Bot. Ark. 31(3): 106, fig. 64. 1977; Seidenfaden, Opera Bot. 114: 63. 1992; Pearce & Cribb, Orch. Bhutan: 155. 2002 [as *acutifera*]; Chen & Cribb in Chen *et al.*, Fl. China 25: 156. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 52, fig. 11. 2009; Averyanov, Turczaninowia 13(2): 75, fig. 49. 2010; Chen *et al.*, Fl. China 25, Illustrations: fig. 205.6–8. 2010; Kurzweil in Fl. Thailand 12(1): 82, fig. 42, pl. IV-2. 2011; Ong *et al.*, Checkl. Orchids Penins. Malaysia [FRIM Res. Pam. 136]: 87. 2017.— *Pecteilis acuifera* (Wall. ex Lindl.) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 51. 2018. Type: Myanmar, Tanintharyi Region, Dawei District, *Wallich s.n.*, Numer. List no. 7045 (holotype **K-LINDL** [K000873763!]).

— *Habenaria tuaniae* R.Rice, Oasis 3: 2. 2007, **nom. inval.** [collector of type not cited]. Type: Myanmar, southern Kayah State, Kawkaik District, *native collector s.n.* (holotype **BKF**!).

Terrestrial herbs, 14–52 cm tall, largely glabrous but leaves, sterile bracts, floral bracts, sepals and petals mostly stiff-hairy on the margin. *Underground tubers* narrowly ellipsoid or oblong, 2.5–4 × 1–2.5 cm. *Stems* terete, erect. *Leaves* mostly 2–4, cauline in the lower half of the stem, lanceolate-oblong or oblong, 3–19 × 0.4–2.2 cm, acute. *Inflorescences* lax or semi-dense, 10–18-flowered; rachis mostly 3–6 cm long; floral bracts lanceolate, longer than pedicel plus ovary, 9–25 × 1.3–2.2 mm. *Flowers* 8–10 mm in diameter, yellow, greenish-yellow or whitish-yellow. *Pedicel and ovary* cylindric-

fusiform, 8–24 mm long. *Sepals*: median sepal forming a hood together with the petals, concave, ovate, 3–5.2 × 2–4 mm, subacute or obtuse; lateral sepals recurved, obliquely ovate-lanceolate, 5–7 × 2.7–4.5 mm, obtuse. *Petals* oblong, 3–5 × 0.9–2.6 mm, obtuse. *Lip* 6–12 × 2.5–5.5 mm, deeply 3-lobed, with a collar in front of the spur mouth; midlobe linear or oblong, 5–12 mm long; side lobes subulate, mostly 1–3 mm long; spur cylindric, 7–19 mm long, slightly shorter than pedicel plus ovary, distal third clavate. *Column* 2.2–4 mm long; anther erect with narrow connective, anther canals about 2 mm long, pollinia narrowly ellipsoid, shorter than the linear caudicles; stigma processes 2–2.5 mm long.

Myanmar.—Kachin State [district not known, 1897, *Shaik Mokim s.n.* (CAL [acc. no. 465094])]. Shan State [Taunggyi District, 1893, *Abdul Khalil s.n.* (CAL [acc. no. 432680 & 465255])]; Loilen District, 1,220 m, 27 July 1911, *Robertson 384* (K); Kengtung District, 1909, *MacGregor 814* (CAL [acc. no. 462374], E); district not known, 1,340 m, July 1888, *Manders s.n.* (K)]. Mandalay Region [Pyinoolwin District, 1,525 m, July 1910, *Rodger 129* (CAL [acc. no. 462373])]. Chin State [Falam District, 1,980 m, 3 Oct. 1910, *Venning 41* (AMES, K)]. Bago Region [Bago District, 27 Dec. 1870, *Kurz 0255* (CAL [acc. no. 432675 & 462376])]; same locality, 14 Dec. 1938, *Kermode 16766* (K), identification uncertain]. Tenasserim [*Parish 229* (not located), fide Parish (1883: 201)]. Kayin State [Kawkareik District, *native collector s.n.* (holotype of *Habenaria tuaniae* R.Rice (BKF))]. Tanintharyi Region [Dawei District, *Wallich s.n.*, *Numer. List no. 7045* (holotype K-LINDL); same locality, *Wallich s.n.*, *Numer. List no. 7051* pro parte (K)]. Not traced [Pinmono, 19 Aug. 1890, *Abdul Huk s.n.* (CAL)]. Without locality [21 Aug. 1890, *Abdul Huk s.n.* (CAL [acc. no. 462377])]; *Brandis 1049* (CAL, with sketches drawn by Hooker); *Brandis 1053* (CAL [acc. no. 462379])]. [17 records]

Distribution.—Eastern Himalayas, north-eastern India, Myanmar, Thailand, Laos, Vietnam, south-western China and Peninsular Malaysia.

Ecology and phenology.—Detailed habitat information is not available in Myanmar; elevations are between 1,220 and 1,980 m. In other parts of the distribution area, *Habenaria acuiifera* is found in deciduous dipterocarp forest, pine forest, evergreen forest, thicket and grassland from 50 to 2,000 m

(Chen & Cribb, 2009; Kurzweil, 2009, 2011). Flowering in Myanmar has been recorded from July to October, with two collections (one of them doubtful) flowering in December; in China and Thailand, the flowering time of *H. acuiifera* is between June and October/November.

25. *Habenaria linguella* Lindl., Gen. Sp. Orchid. Pl.: 325. 1835; Seidenfaden, Dansk Bot. Ark. 31(3): 107, fig. 65. 1977; Seidenfaden, Opera Bot. 114: 63, fig. 31. 1992; Chen & Cribb in Chen *et al.*, Fl. China 25: 156. 2009; Averyanov, Turczaninowia 13(2): 75, fig. 50. 2010; Chen *et al.*, Fl. China 25, Illustrations: fig. 205.1–5. 2010; Barretto *et al.*, Wild Orch. Hong Kong: 254, figs. 212–215. 2011.—*Habenaria acuiifera* Wall. ex Lindl. var. *linguella* (Lindl.) Finet, Rev. Gén. Bot. 13: 525. 1901.—*Pecteilis linguella* (Lindl.) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 52. 2018. Type: China, Kwangtung, *Millet s.n.* (lectotype K, designated by Seidenfaden, 1977).

—*Centrochilus gracilis* Schauer, Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19(Suppl. 1): 435. 1843. Type: China, Promontorium Syng-moon, *Meyen s.n.* (not found).

—*Habenaria endothis* Miq., J. Bot. Néerl. 1: 92. 1861. Type: China, Kwangtung, *Krone s.n.* (lectotype U [U.1459911!], designated here; isolectotypes P [P00411351!], ? AMES [AMES00099837!]).

—*Habenaria chrysantha* Schltr., Repert. Spec. Nov. Regni Veg. 17: 25. 1921. Type: China, Yunnan, Pe yen tsin, in forest, 3 Aug. 1919 and 15 Aug. 1919, *Siméon Ten s.n.* (not found).

—*Habenaria simeonis* Kraenzl., Repert. Spec. Nov. Regni Veg. 17: 107. 1921. Type: China, Yunnan, Pe yen tsin, 30 Aug. 1919, *Siméon Ten 1255* (lectotype C [C10023501!, as 1253], designated here; isolectotype K [K000796943!, as 1253, single flower]).

Terrestrial herbs, often robust, 20–75 cm tall. *Underground tubers* 3–5 × 1–2 cm. *Stems* glabrous, terete, erect. *Leaves* 3–4, cauline in the lower half of the stem, narrowly lanceolate-oblong or narrowly oblong, usually 5–12 × 1.2–2 cm, acute. *Inflorescences* semi-dense or dense, 9–20-flowered; floral bracts linear-lanceolate, shorter or longer than pedicel plus ovary, 12–25 mm long, ciliate. *Flowers* brownish-yellow or yellow. *Pedicel and ovary* cylindric-fusiform, 18–23 mm long. *Sepals*: median sepal forming a hood together with the petals, concave,

ovate-elliptic, $4.5 \times 3\text{--}3.5$ mm, obtuse; lateral sepals recurved, obliquely ovate-elliptic, $6\text{--}7 \times 4\text{--}4.5$ mm, subacute or obtuse. *Petals* obliquely and narrowly elliptic, $4.5 \times 2\text{--}2.5$ mm, obtuse. *Lip* 9–10 mm long, deeply 3-lobed from near the base, with a small collar in front of the spur entrance; midlobe linear or oblong, 8–9 mm long, obtuse; side lobes subulate, 1.5–2.75 mm long, acute; spur cylindric, 20–29 mm long, longer than pedicel plus ovary, clavate. *Column*: anther erect with narrow connective, anther canals 2–3 mm long, angled upwards, pollinia narrowly obovoid, shorter than the linear caudicles; stigma processes ca 1.5 mm long.

Myanmar.—Shan State [Loilen District, 1,220 m and above, 1910, *Robertson* 7 (**K**)]. [1 record]

Distribution.—Eastern Myanmar, Vietnam and southern and south-western China.

Ecology and phenology.—In Myanmar the habitat was not recorded; the single collection was made at an elevation of ‘1,220 m and above’. In China, the plants grow in forest and grassland at 500–2,500 m (Chen & Cribb, 2009). The flowering time is not known in Myanmar; flowering in China has been recorded from June to August.

26. *Habenaria rostrata* Wall. ex Lindl., Gen. Sp. Orchid. Pl.: 325. 1835; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883; Hooker, Fl. Brit. India 6: 146. 1890; Grant, Orchids Burma: 341. 1895; Seidenfaden, Dansk Bot. Ark. 31(3): 110, fig. 67. 1977; Seidenfaden, Opera Bot. 114: 63. 1992; Chen & Cribb in Chen *et al.*, Fl. China 25: 156. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 59, fig. 14. 2009; Averyanov, Turczaninowia 13(2): 79, fig. 53. 2010; Chen *et al.*, Fl. China 25, Illustrations: fig. 206.7–9. 2010; Kurzweil in Fl. Thailand 12(1): 138, fig. 79, pl. XI-2. 2011.—*Habenaria acuifera* Wall. ex Lindl. var. *rostrata* (Wall. ex Lindl.) Finet, Rev. Gén. Bot. 13: 526. 1901. Type: Myanmar, Bago Region, Pyay District, Pyay, 1826, *Wallich s.n.*, Numer. List no. 7051A (holotype **K-LINDL** [K000873764!]; isotype **GH**!).

Terrestrial herbs, 17–38 cm tall, glabrous except for the sterile bracts, floral bracts, sepals and petals which have often denticulate or hairy margins, and the hairy ovary. *Underground tubers* oblong, $2\text{--}3 \times 0.8\text{--}1$ cm. *Stems* terete, erect. *Leaves* 2–5,

cauline, scattered in the lower half of the stem, oblanceolate-oblong, mostly $4.5\text{--}12 \times 0.7\text{--}1.4$ cm, acute. *Inflorescences* semi-dense, mostly 7–18-flowered; rachis 2–8 cm long; floral bracts lanceolate, shorter than pedicel plus ovary, 9–18 mm long, acuminate. *Flowers* 10–12 mm in diameter, pink, orange-brown, brown, red-orange, or less often yellow or white with brown lip. *Pedicel and ovary* cylindric-fusiform, 15–27 mm long, with an elongate beak. *Sepals* subacute or obtuse; median sepal erect, forming a hood together with the petals, concave, suborbicular, mostly $3.5\text{--}5 \times 3\text{--}4$ mm; lateral sepals reflexed, obliquely ovate-elliptic, $4.5\text{--}7 \times 3\text{--}4.8$ mm. *Petals* falcately oblong, $3\text{--}5 \times 1.7\text{--}2$ mm, obtuse. *Lip* 8–14 mm long, deeply 3-lobed, lobes linear and 7–15 mm long, midlobe and side lobes equally long or side lobes longer, with a collar in front of the spur mouth; spur cylindric, 15–25 mm long, slightly shorter than pedicel plus ovary, distally clavate. *Column* 2.5–3 mm long; anther reflexed with narrow connective, anther canals 2–3 mm long and slightly curved upwards, pollinia ellipsoid, caudicles linear; auricles prominent and nearly as high as the anther; stigma processes oblong, to 2 mm long. *Capsule* elliptic-fusiform, to 23×4.1 mm, beaked.

Myanmar.—Shan State [Loilen District, 1,370 m, 27 July 1911, *Robertson* 383 (**K**); district not known, 1,340 m, 7 July 1890, *Prazer* 169 (**CAL** [acc. no. 462354])]. Bago Region [Pyay District, 1826, *Wallich s.n.*, Numer. List no. 7051A (holotype **K-LINDL**; isotype **GH**)]. Yangon Region [district not known, *Scott* 192 (**CAL** [acc. no. 462353])]. Without locality [*Parish* 228 (not located), fide Parish (1883: 201)]. [5 records]

Distribution.—Myanmar, Thailand, Laos, Vietnam and south-western China.

Ecology and phenology.—No habitat information is available in the specimens from Myanmar; elevations of between 1,340 m and 1,370 m have been recorded in two collections. In other parts of the distribution area, the species is found in open areas in deciduous or evergreen forest, in pine forest, savanna, thicket and along forest margins (Chen & Cribb, 2009; Kurzweil, 2009, 2011). Elevations are given as 50–1,120 m in Thailand and 900–2,000 m in China. Flowering in July has been reported in Myanmar; in China and Thailand flowering takes place mainly between July and September, rarely as late as October.

Notes.— Sometimes mixed up with the similar *Habenaria acuiifera*, but differing by the long lip side lobes and the truncately cut-off collar in front of the spur mouth.

27. *Habenaria vidua* C.S.P.Parish & Rchb.f., Trans. Linn. Soc. London 30: 140. 1874; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883; Hooker, Fl. Brit. India 6: 146. 1890; Grant, Orchids Burma: 344. 1895; Seidenfaden, Dansk Bot. Ark. 31(3): 112, fig. 69. 1977; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 62, fig. 15. 2009; Kurzweil in Fl. Thailand 12(1): 145, fig. 85, pl. XII-1. 2011. Type: Myanmar, Mon State, Mawlamyine District, *Parish 223* (lectotype **K** [K000387582!], designated by Ormerod *et al.*, 2021; isolectotype **W-R** 1618!; icon. **W-R** 11146!). Syntype: same locality, *Parish 116* (**K** [K000247448!, K000247449!]).

Usually lithophytic herbs, mostly slender, 10–36 cm tall. *Stems* terete, erect, elongate-papillate and hairy. *Leaves* 2–5, cauline in a cluster in the basal part of the stem, elliptic-ob lanceolate, 3–14 × 1.3–3 cm, subacute, glabrous, margins often hairy. *Inflorescences* lax, 4–10-flowered; rachis 4–21 cm long; floral bracts lanceolate, shorter than pedicel plus ovary, 9–19 × 2.8–5.5 mm, acuminate, glabrous, margins hairy. *Flowers* to 17 mm in diameter, white or whitish-yellow. *Pedicel and ovary* 15–22 mm long. *Sepals* subacute; median sepal cohering with the petals, concave, erect, suborbicular, 6.5–9 × ca 4 mm; lateral sepals reflexed, ovate-lanceolate, 6–7 × 3.8–4.7 mm. *Petals* broadly ovate, 6–8 × 4–6 mm, subacute. *Lip* 8–11 mm long, deeply 3-lobed to the base; midlobe linear or oblong, 7–10 mm long, recurved below the flower; side lobes linear to oblong, 12–15 mm long, sharply curved upwards; spur slender cylindric, 20–30 mm long, longer than pedicel plus ovary. *Column* 2.5–4 mm long; anther reflexed, anther canals straight, about 2 mm long; stigma processes globose, short.

Myanmar.— Kayah State [Loikaw District, 1,320 m, 21 Aug. 2018, *Tanaka et al.* MY2655 (TNS)]. Mon State [Mawlamyine District, *Parish 223* (lectotype **K**; isolectotype **W-R**; icon. **W-R**); same locality, *Parish 116* (syntype **K**). [3 records]

Distribution.— Myanmar and Thailand.

Ecology and phenology.— Habitat information was not recorded in Myanmar; one of the collections

was made at 1,320 m elevation. In Thailand, the species is found in full sun or partial shade in crevices in limestone rocks in evergreen or deciduous forest and on mountain slopes and summits (Kurzweil, 2009, 2011). Elevations in Thailand range from 740–1,800 m. Flowering in Myanmar has been recorded in August in one of the collections; in Thailand flowering occurs from June to September.

28. *Habenaria corticicola* W.W.Sm., Notes Roy. Bot. Gard. Edinburgh 13: 206. 1921. Type: Myanmar, Kachin State, Myitkyina District, Mang-kyi, epiphytic on alder trees, rooted in the crevices of the bark, 1,220 m, 15 Aug. 1919, *Kingdon-Ward 3538* (holotype **E** [E00381987!]). Fig. 2D.

Epiphytic herbs, slender, 20–35 cm tall. *Leaves* 3–6, cauline, in a cluster in the lower half of the stem, oblanceolate or oblong, 7–18 × 2.2–2.5 cm, acuminate. *Inflorescences* lax, 4–18-flowered; rachis 6–15 cm long; floral bracts lanceolate, shorter than pedicel plus ovary, 15–19 mm long. *Flowers* pale greenish-yellow. *Pedicel and ovary* cylindric-fusiform, with narrow neck, together about 20 mm long. *Sepals* obtuse; median sepal ovate, 6–7 × ca 4.5 mm, cucullate; lateral sepals deflexed, falcately ovate-lanceolate, 6–8 × ca 4 mm. *Petals* linear-oblong, about as long as the sepals, 6–8.5 × ca 1.5 mm, obtuse. *Lip* longer than the sepals, deeply 3-lobed; midlobe linear, similar in length to the side lobes but slightly wider; side lobes filiform, inserted at right angle on the midlobe, 15–27 mm long and 1.5 mm wide at base, curved upwards; spur cylindric, 30–35 mm long, much longer than pedicel plus ovary, distal third clavate. *Column* ca 3.5 mm long; anther canals about 1 mm long, pollinia 1 mm long, half as long as the caudicles; stigma processes narrowly cylindric, about 2 mm long.

Myanmar.— Kachin State [Myitkyina District, ? Tsawlaw Township, *Kingdon-Ward 3538* (holotype **E**); same district, 1,370 m, 19 Aug. 1939, *Kaulback 348* (**BM**)]. [2 records]

Distribution.— Endemic to northern Myanmar; so far known only from the type collection and a second collection from a nearby locality.

Ecology and phenology.— Both specimens of *Habenaria corticicola* known at present were growing as epiphytes. According to the herbarium label of the type specimen, it was rooted in the crevices of the bark of an alder tree, which is the

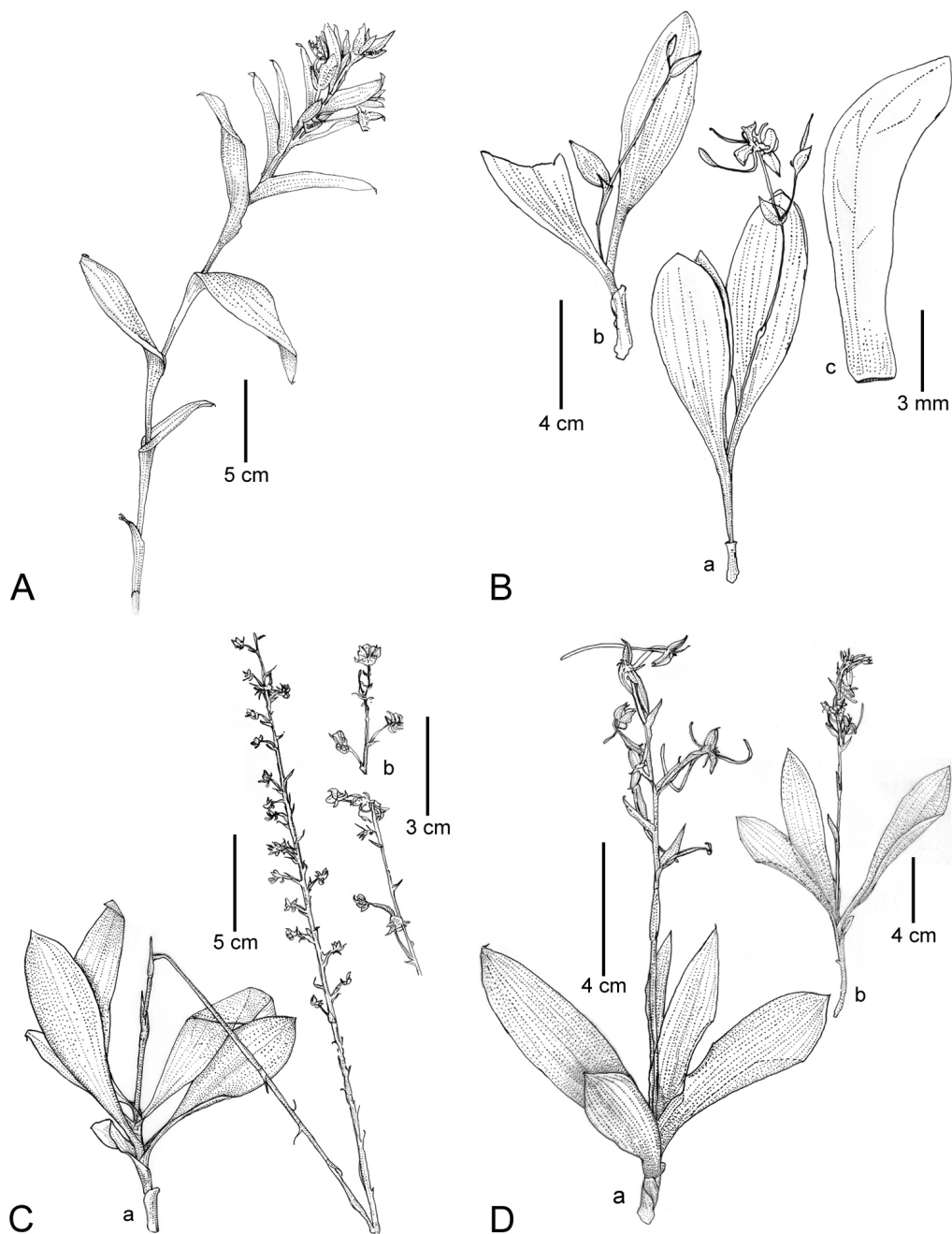


Figure 2. A. *Habenaria triquetra* Rolfe: habit. From Hildebrand *s.n.* (holotype **K**). B. *H. spatulifolia* C.S.P.Parish & Rechb.f.: a–b. habit; c. petal. From Parish 217 (holotype **K**). C. *H. shweliensis* W.W.Sm. & Banerji: a. habit; b. parts of inflorescences. From Rodger 387 (isotype **K**). D. *H. corticicola* W.W.Sm.: a–b. habit. From Kingdon-Ward 3538 (holotype **E**). All drawn by C. Sathish Kumar.

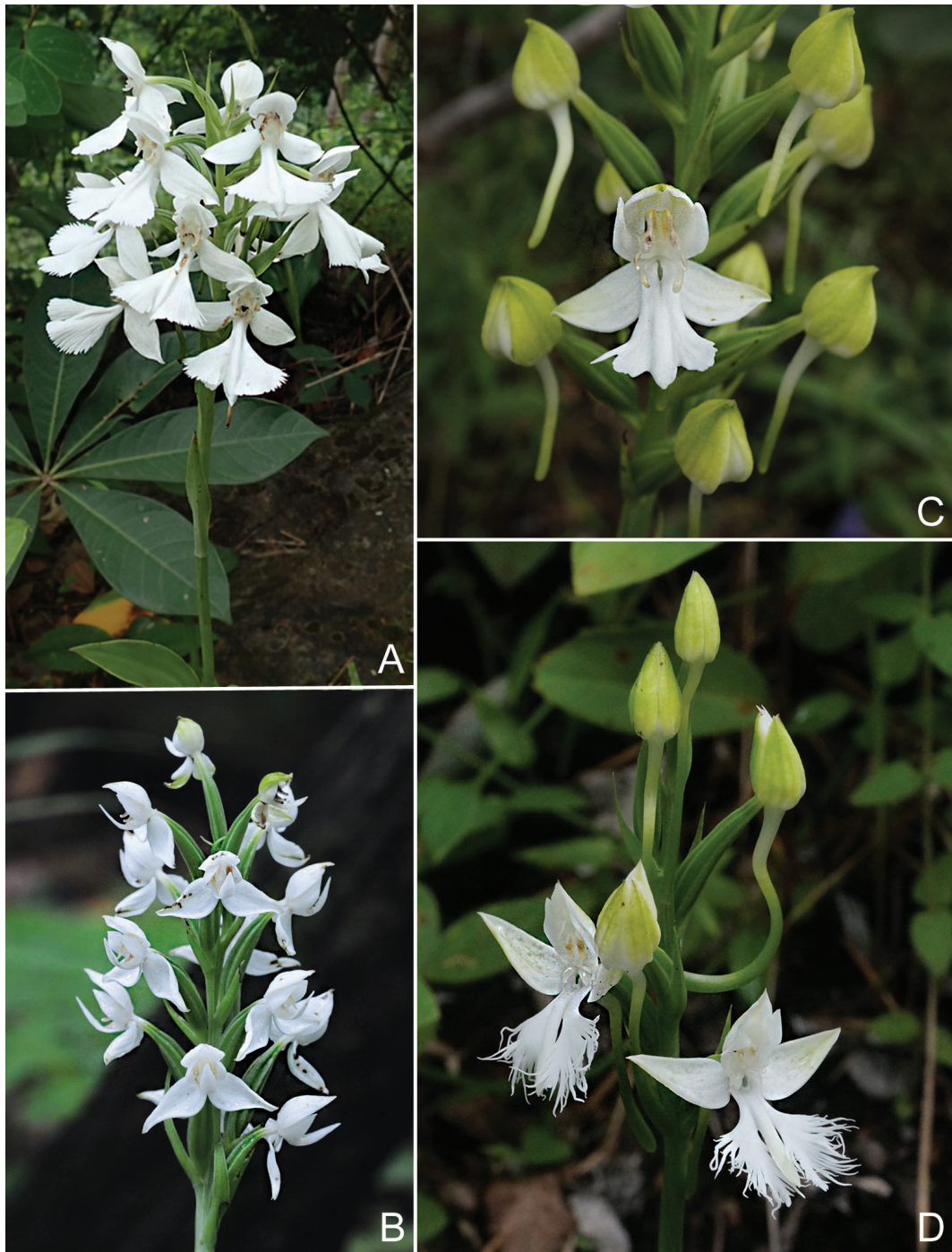


Figure 3. A–C. *Habenaria dentata* (Sw.) Schltr.; D. Suspected hybrid *H. dentata* (Sw.) Schltr. \times *H. trichosantha* Lindl. Photos: A by Nobuyuki Tanaka, B–D by Young-Dong Kim.

origin of the species name. Elevations of the two specimens are 1,220 and 1,370 m, respectively. Flowering in the middle of August.

29. *Habenaria plurifoliata* Tang & F.T.Wang, Bull. Fan Mem. Inst. Biol., Bot. 10: 40. 1940; Chen & Cribb in Chen *et al.*, Fl. China 25: 159. 2009; Chen *et al.*, Fl. China 25, Illustrations: fig. 212.1–5. 2010.— *Pecteilis plurifoliata* (Tang & F.T.Wang) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 53. 2018. Type: China, Yunnan, Che-li Hsien, Mong-hein or Gan-la-ba, 720 m, Oct. 1936, Wang 79921 (holotype not known; isotypes **PE** [PE01432215, PE00340390], **WUK** [WUK0041254], **AMES** [AMES00104949!]).

Herbs, terrestrial, 28–33 cm tall. *Tubers* cylindric-oblong, ca 2.5 × 0.8 cm. *Stems* terete, erect, stout. *Leaves* 4–10, rosette-like near the stem base, suberect or spreading; blade linear-lanceolate, 7–9 × 0.8–1.1 cm, acute. *Inflorescences* lax, 10–25-flowered; rachis 6–17 cm long; floral bracts lanceolate, those at the base of the inflorescence nearly as long as pedicel plus ovary, acuminate. *Flowers* yellowish-green or white. *Pedicel and ovary* 8–12 mm long. *Sepals*: median sepal forming a hood together with the petals, erect, concave, ovate, ca 5 × 2.9 mm, subacute or obtuse; lateral sepals reflexed, ovate-lanceolate, ca 6 × 2.4 mm, subacute. *Petals* falcately ovate-ligulate, ca 4.5 × 1.2 mm, subacute. *Lip* deeply 3-lobed; midlobe linear, ca 7 mm long; side lobes filiform, ca 14 mm long, at right angle to the midlobe; spur cylindric, ca 14 mm long, longer than pedicel plus ovary, slightly clavate. *Column*: anther with wide connective; stigma processes clavate.

Myanmar.—Kachin State [Putao District, Jin *et al.* Jin-14581 (**PE**) (fide Aung *et al.* (2020: 87)). [1 record]

Distribution.—Northern Myanmar and south-western China.

Ecology and phenology.—The habitat and the flowering time are not known in Myanmar. In China, *Habenaria plurifoliata* is found in forest near rivers at 700–1,600 m elevation and flowers in October (Chen & Cribb, 2009).

Notes.—The location of the holotype is uncertain, but there are four known isotypes (see above).

30. *Habenaria tonkinensis* Seidenf., Dansk Bot. Ark. 31(3): 114, fig. 70. 1977; Seidenfaden, Opera Bot. 114: 63, fig. 32. 1992; Chen & Cribb in Chen *et al.*, Fl. China 25: 159. 2009; Averyanov, Turczaninowia 13(2): 82, figs. 55 & 61d–e. 2010; Chen *et al.*, Fl. China 25, Illustrations: fig. 211.1–6. 2010.— *Pecteilis tonkinensis* (Seidenf.) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 53. 2018. Type: Vietnam, Tonkin, Taai Wong Mo Shan, Tong Fa market, Ha-coi, in thicket, on moist solid rocks, 11–23 Sept. 1939, Tsang 29566 (lectotype **C** [C10016240!], designated here; isolectotypes **K** [K000827083!]), **AMES** [AMES00256476!]).

Terrestrial or lithophytic herbs, 20–40 cm tall. *Tubers* oblong, 3–4 × 1–1.5 cm. *Stems* terete, erect, stout, glabrous. *Leaves* 6–13, radical and in a cluster at the base of the stem, suberect or spreading, narrowly lanceolate, 5–13 × 0.5–1.5 cm, acute. *Inflorescences* lax, ca 20-flowered; rachis 10–21 cm long; floral bracts ovate-lanceolate or lanceolate, 13–17 mm long, long-acuminate. *Flowers* 6–8 mm in diameter, white. *Pedicel and ovary* cylindric-fusiform, 8–15 mm long. *Sepals* obtuse; median sepal forming a hood together with the petals, erect, concave, elliptic, 4–5 × 3–3.5 mm; lateral sepals reflexed, obliquely elliptic, 4.5–6 × 2.5–3 mm. *Petals* narrowly oblong or linear, slightly oblique, 4–5 × 1–1.2 mm, acute. *Lip* deeply 3-lobed from the base, lobes linear-oblong, with a low collar in front of the spur entrance; midlobe 4–8 mm long, downwards-pointing; side lobes at more or less right angle to the midlobe, to 11 mm long; spur cylindric-clavate, 14–17 mm long, longer than pedicel plus ovary. *Column* 1.5–2 mm long; anther erect with narrow connective, anther canals about 1 mm long, pollinia obovoid, shorter than the linear caudicles; stigma processes ca 0.5 mm long, clavate.

Myanmar.—Kachin State [Putao District, Jin *et al.* PT-2545 (**PE**) (fide Aung *et al.* (2020: 87)). [1 record]

Distribution.—Northern Myanmar, Laos, Vietnam, Cambodia and south-western China.

Ecology and phenology.—No information on habitat and flowering time is available in the single record from Myanmar. In China, the species has been reported in broad-leaved forest at 600–1,200 m (Chen & Cribb, 2009) and in Indochina in evergreen forest and on mossy rocks near streams at 200–300

m (Averyanov, 2010; type collection). Flowering in China occurs in September and October; in Indochina, flowering has been recorded from April to June (Averyanov, 2010), except for the type collection which was flowering in September.

Notes.— The species resembles *Habenaria viridiflora* (Rottler ex Sw.) R.Br. ex Spreng., but differs in the larger number of leaves and in its narrow petals.

The number *Tsang 29566* was indicated as the type by Seidenfaden (1977), but he cited two different herbaria where the specimens are deposited (**C** and **K**), and therefore this cannot be considered a valid lectotypification. Although the **C** sheet was obviously the most easily accessible for Seidenfaden as he was living there, one can assume that both were being worked on by him while drafting the description of his new species. This is evident in handwritten notes (**C** sheet: flower put in alcohol; **K** sheet: drawing made). We now designate the specimen at **C** as the lectotype as it is complete and has several intact flowers.

31. *Habenaria* cf. *viridiflora* (Rottler ex Sw.) R.Br. ex Spreng., Syst. Veg. 3: 691. 1826; Hooker, Fl. Brit. India 6: 150. 1890; Seidenfaden, Dansk Bot. Ark. 31(3): 118, fig. 74. 1977; Seidenfaden, Opera Bot. 114: 67. 1992; Chen & Cribb in Chen *et al.*, Fl. China 25: 158. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 69, figs. 18–19. 2009; Chen *et al.*, Fl. China 25, Illustrations: fig. 211.7–9. 2010; Averyanov, Turczaninowia 13(2): 70, fig. 47. 2010; Kurzweil in Fl. Thailand 12(1): 148, fig. 86, pl. XII-2. 2011.— *Orchis viridiflora* Rottler ex Sw., Kongl. Vetensk. Acad. Nya Handl. 21: 206. 1800. Type: ‘India Orientalis’, *Rottler s.n.* (lectotype **S** [acc. no. S 07-289.2!], designated by Bramhadande & Nandikar, 2023; possible isoelectotype **S** [acc. no. S 07-288.1!]). Syntype: same locality, *Rottler s.n.* (**C** [C10016243!]).

— *Habenaria tenuis* Griff., Calcutta J. Nat. Hist. 4: 379. 1844. Type: India, Serampore, *Griffith s.n.* (not found).

Terrestrial herbs, slender or robust, 23–45 cm tall, glabrous. *Underground tubers* oblong, 1.5–2 × 0.8–1 cm. *Leaves* 2–5, basal, spreading or suberect, narrowly lanceolate, 5–11 × 0.4–0.85 cm, acute. *Inflorescences* lax, 12–many-flowered; rachis 8–24

cm long; floral bracts lanceolate or ovate-lanceolate, shorter than pedicel plus ovary, 3.5–8 × 1–2 mm, acuminate. *Flowers* 4.8–7 mm in diameter, yellowish-green or green. *Ovary* cylindric-fusiform, 4.2–7.7 mm long, distinct from the pedicel which is 1.5–3.5 mm long. *Sepals* subacute or obtuse; median sepal forming a hood together with the petals, erect, concave, suborbicular, 2–3.5 × 1.3–2.5 mm; lateral sepals spreading or reflexed, ovate-oblong, 2.8–4.4 × 1.3–3.5 mm. *Petals* triangular-ovate, 2–3.8 × 0.5–1.5 mm, acute or obtuse. *Lip* 3.2–9 mm long, deeply 3-lobed from the base, lobes oblong or narrowly oblong with obtuse apex; midlobe 3–5 mm long; side lobes as long as midlobe or longer, 3–6 mm long; spur slender cylindric, to 21 mm long, much longer than the ovary. *Column* 1–1.5 mm long; anther reflexed, anther canals short, pollinia obovoid, with short caudicles; stigma processes clavate, 0.5–1 mm long. *Capsule* elliptic-fusiform, ca 12.8 mm long, shortly stalked.

Myanmar.— Mandalay Region [Myingyan District, fide Tanaka *et al.* (2011: 164), photographic record]. Tanintharyi Region [Dawei District, 1827, *without collector 235* (**CAL** [acc. no. 462480]), identification uncertain]. [2 records]

Distribution.— Sri Lanka, India, Bangladesh, Myanmar, Thailand, Laos, Vietnam, Cambodia and southern China.

Ecology and phenology.— In Myanmar the habitat and flowering time were not recorded. In Thailand and China, the species is found in damp grassy areas and in forest (Chen & Cribb, 2009; Kurzweil, 2009, 2011). On one collector’s label of a Thai specimen, it has been recorded as common in rice fields. Elevation was not indicated in the consulted literature on China and Thailand. Flowering occurs between June and September in China and Thailand.

Notes.— *Habenaria viridiflora* can be expected to occur in Myanmar, but good plant material is required to confirm the record. On the **CAL** sheet 462480, there are seven specimens pasted together but only a few flowers are left that do not allow a close study.

The specimen **S 07-289.2**, an unnumbered Rottler collection from ‘India Orientalis’, was chosen as the lectotype because this is where O. Swartz’s original herbarium is kept. It can be

assumed that Swartz drafted the description of his new species based on material in his own herbarium that he had easy access to. We think that the **C** specimen is probably a duplicate that was sent later and it is not known whether Swartz actually saw it. Previously, Seidenfaden (1977) selected an unnumbered Rottler collection at **C** as 'type or isotype', but we think his choice is not valid.

32. *Habenaria ditricha* Hook.f., Fl. Brit. India 6: 151. 1890; Grant, Orchids Burma: 336. 1895. Type: Myanmar, Mon State, Mawlamyine District, 1846, *Lobb 350* (lectotype **K** [K000247476!], designated here; isoelectotypes **K** [K000247477!], **AMES** [AMES00099827!], **K-LINDL.**!). Fig. 4E & 5A.

— *Habenaria javanica* Kraenzl., Bot. Jahrb. Syst. 16: 162. 1892; Comber, Orch. Java: 64. 1990. Type: 'Java' (? Myanmar), *Lobb 350* (holotype **LE** [LE0001115!]; isotype **BM** [BM000033524!]).

Terrestrial herbs, slender, to 30 cm tall, glabrous. *Underground tubers* to 1.5 × 0.8 cm. *Stems* terete, erect. *Leaves* mostly 6–10, basal, spreading or suberect, linear-oblong or oblong, 4–9 × 0.4–0.85 cm, acute or obtuse. *Inflorescences* lax, 10–20-flowered; rachis mostly 5–10 cm long; floral bracts ovate-lanceolate, slightly shorter to slightly longer than pedicel plus ovary, 6–13 × ca 3 mm. *Flowers* small, yellow-green. *Pedicel and ovary* 6–13 mm long, with a narrow neck. *Sepals*: median sepal ovate or elliptic-ovate, 3–5.5 × 2.7–3.5 mm, obtuse; lateral sepals recurved, elliptic-lanceolate, 2–6 × ca 2 mm, subacute. *Petals* falcate, ligulate to ovate-oblong, 4.8–6.5 × ca 1.5 mm, subacute. *Lip* much longer than the sepals, deeply 3-lobed from the base; mid-lobe narrowly oblong, 4–9 mm long; side lobes filiform, 7–20 mm long, longer than the midlobe; spur cylindric-clavate, 6–11 mm long. *Column*: anther canals short; stigma processes compressed.

Myanmar.— Kachin State [Putao District, Putao Township, 450 m, 5 Oct. 2016, *Armstrong et al.* 1649 (**NY**, **SING**)]. Mon State [Mawlamyine District, *Lobb 350* (lectotype **K**; isoelectotypes **AMES**, **K**, **K-LINDL.**)]. ? Myanmar [*Lobb 350* (holotype of *Habenaria javanica* Kraenzl. **LE**, isotype **BM**). [3 records, one of them doubtful]

Distribution.— Endemic.

Ecology and phenology.— Information on habitat and flowering phenology is not available in

the type collection. The specimen from Putao was growing in sandy soil on a river bank at 450 m, and was flowering in the beginning of October.

Notes.— The species is very close to *Habenaria khasiana* Hook.f. According to Hooker (1890), *H. ditricha* differs in having a shorter scape, different bracts, shorter ovaries and smaller flowers.

The specimen *Lobb 350* at **K** is here designated as the lectotype as it comprises two complete plants with apparently intact flowers. It also includes sketches of the flower structure and the floral segments.

33. *Habenaria furcifera* Lindl., Gen. Sp. Orchid. Pl.: 319. 1835; Hooker, Fl. Brit. India 6: 149. 1890; Seidenfaden & Smitinand, Orch. Thailand I: 37; IV(2): 727. 1959–1965; Seidenfaden, Dansk Bot. Ark. 31(3): 118, fig. 72. 1977; Pearce & Cribb, Orch. Bhutan: 149. 2002; Chen & Cribb in Chen *et al.*, Fl. China 25: 160. 2009; Raskoti, Orch. Nepal: 153 (incl. colour photos). 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 63, fig. 16. 2009; Chen *et al.*, Fl. China 25, Illustrations: fig. 214.1–4. 2010; Kurzweil in Fl. Thailand 12(1): 101, fig. 55, pl. VI-2. 2011.— *Pecteilis furcifera* (Lindl.) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 51. 2018. Type: India, Mussoorie, Royle *s.n.* (holotype **K-LINDL** [K001328010!]). Fig. 4B.

— *Habenaria hamigera* Griff., Calcutta J. Nat. Hist. 4: 380. 1844. Type: Bangladesh, *Griffith 5313* (holotype **K** [K000247459!]).

Terrestrial herbs, robust, 24–68 cm tall, glabrous except for the ciliate margins of the sterile bracts and floral bracts. *Underground tubers* oblong, 4–5 × 2–2.5 cm. *Stems* erect, terete. *Leaves* 2–6, cauline in the lower half of the stem, ovate-elliptic or oblong-ovate, mostly 8–24 × 3–6.5 cm, acute. *Inflorescences* laxly many-flowered; rachis mostly 9–23 cm long; floral bracts lanceolate, shorter to longer than pedicel plus ovary, mostly 6.5–15 × 2–3.9 mm, acuminate. *Flowers* 7–13 mm in diameter, green or pale green. *Pedicel and ovary* 12–21 mm long. *Sepals* subacute or obtuse; median sepal erect, forming a hood together with the petals, concave, ovate, mostly 4.3–5 × 2.2–3 mm; lateral sepals reflexed, ovate-lanceolate, mostly 3.5–5 × 1.6–2

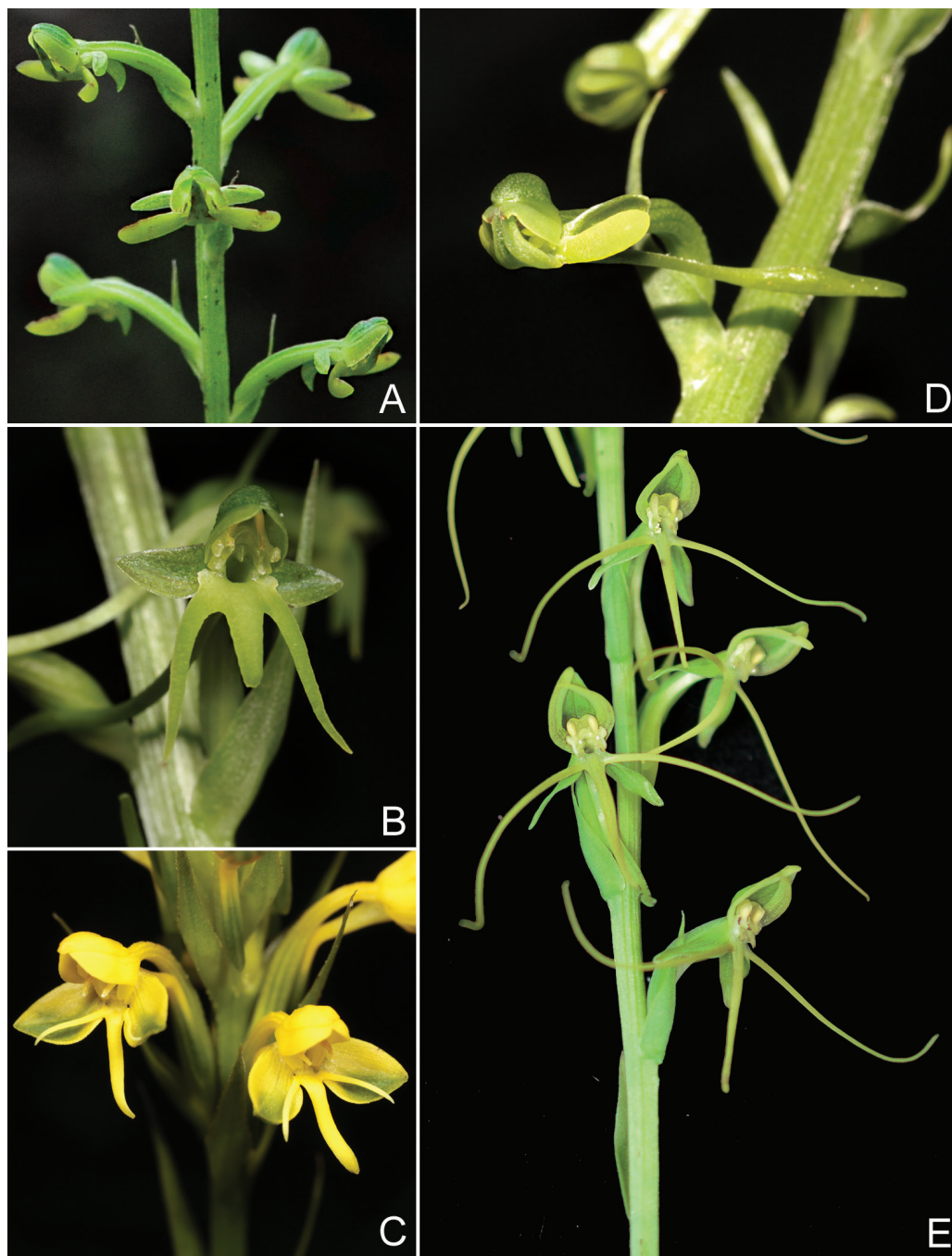


Figure 4. A. *Habenaria shweliensis* W.W.Sm. & Banerji; B. *H. furcifera* Lindl.; C. *H. chlorina* C.S.P.Parish & Rchb.f.; D. *H. lucida* Wall. ex Lindl.; E. *H. ditricha* Hook.f. (coll. *Armstrong et al.* 1649). Photos: A. by Young-Dong Kim, B–C. by Jean-Michel Hervouet, D. by Santi Watthana, E by Kate Armstrong.

mm. *Petals* oblong-elliptic, $3\text{--}5 \times 1\text{--}2.3$ mm, obtuse. *Lip* $4\text{--}11 \times \text{ca } 4$ mm, deeply 3-lobed from the base, lobes linear; midlobe $3\text{--}6.5$ mm long; side lobes $4\text{--}10.5$ mm long, slightly curved; spur cylindric, $17\text{--}25$ mm long, longer than pedicel plus ovary, slender throughout. *Column* $2\text{--}3$ mm long; anther erect, with narrow connective, anther canals short; stigma processes suboblong, ca 1 mm long; central rostellum lobe with a prominent conical callus. *Capsule* elliptic-fusiform, $13.5\text{--}17$ mm long.

Myanmar.— Upper Myanmar [June 1899, *Shaik Mokim s.n.* (CAL [acc. no. 462430])]. Kachin State [Myitkyina District, Aug. 1899, *Shaik Mokim 25* (CAL [acc. no. 462428 & 462429])]; same locality, Aug. 1899, *Shaik Mokim 137* (CAL, K)]. Shan State [Taunggyi District, 1,065 m, 22 Sept. 2015, *Baba et al. 103639* (MBK)]. Mandalay Region [Pyinoolwin District, 1,220 m, 14 Oct. 1940, *Rhind 3706* (CAL)]; same locality, 660–690 m, 3 Aug. 2019, *Hervouet s.n.*, photographic record]. Mandalay Region or Bago Region [Pegu Yoma, 31 Jan. 1871, *Kurz 3274* (CAL [acc. no. 462424])]. Border Magway Region and Chin State (Gangaw and Mindat districts) [445–850 m, 29 Aug. 2013, *Fujikawa et al. 094691* (MBK)]. Chin State [Mindat District, 1,220 m, 12 July 1956, *Kingdon-Ward 22474* (BM)]; same locality, 1,220 m, 22 Aug. 1956, *Kingdon-Ward 22580* (BM)]; same locality, 1,065 m, Aug. 1956, *Maung Gale-2 5861* (RAF); same locality, 1,830 m, 12 Sept. 1956, *Maung Gale-2 & Chit Ko Ko 5757* pro parte (RAF); same locality, 2 Aug. 2007, *Ling Shein Man 055224* (MBK); same locality, 10 Aug. 2008, *Yasuda 060090* (MBK); same locality, 500 m, 6 Dec. 2012, *Fujikawa et al. 090112* (MBK), identification uncertain; district not known, June 1892, *Abdul Huk s.n.* (CAL [acc. no. 4624531])]. Bago Region [Taungoo District, 305 m, 3 Dec. 1926, *Chin 4281* (CAL [acc. no. 462425])]. Yangon Region [central part, 30 m, 18 Aug. 1948, *Po Khant 661* (CAL)]. Not traced [Sidou, 1,830 m, Sept. 1899, *Shaik Mokim 40* (CAL [acc. no. 462429])]. [19 records]

Distribution.— Pakistan, India, Himalayas, Bangladesh, Myanmar, Thailand and south-western China.

Ecology and phenology.— In Myanmar growing in deciduous forest, on the edge of evergreen forest and in grassland, at elevations ranging from 30 to 1,830 m. In neighbouring Thailand also found in bamboo forest and

thorn-scrub over granite and shale (Kurzweil, 2009). In Myanmar, flowering mainly from June to October, with two collections (one of them doubtful) flowering in December. This corresponds largely with the flowering in other nearby countries in mainland Asia where flowering occurs mainly from July to December (Pearce & Cribb, 2002; Chen & Cribb, 2009; Kurzweil, 2009, 2011; Raskoti, 2009).

34. *Habenaria masoniana* King & Pantl., J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 601. 1897 [as *massoniana*]. Type: Myanmar, south-western Shan State, Taunggyi District, Fort Stedman, 1893, *Abdul Khalil s.n.* (holotype CAL [CAL0000056840!, CAL0000094108!, CAL0000094109!, CAL0000094110!]). Fig. 6.

Terrestrial herbs, slender, 21–25 cm tall. *Stems* terete, erect. *Leaves* 2 or 3, cauline in the lower third of the stem, oblong-ob lanceolate, mostly $5\text{--}10 \times 1\text{--}1.3$ cm, acute or subacute. *Inflorescences* lax, 7–10-flowered; rachis $3.8\text{--}7.6$ cm long; floral bracts linear, shorter than pedicel plus ovary, acuminate. *Flowers* ca 11 mm in diameter, colour unknown (? blue). *Pedicel and ovary* slender, shortly stalked, beak obscure. *Sepals*: median sepal broadly ovate or rotund, 4–5 mm long, obtuse or subacute; lateral sepals deflexed, ovate-lanceolate, about 6 mm long, subacute. *Petals* linear, about as long as the sepals, acute or subacute. *Lip* longer than the sepals and petals, deeply 3-lobed from the base; midlobe linear, straight; side lobes filiform, inserted at right angle on the midlobe and pointing to the sides, ca 7 mm long, slightly longer than the midlobe, curved; spur cylindric, about 10 mm long, slightly shorter than pedicel plus ovary, apically somewhat clavate, slightly curved. *Column*: anther connective narrow, anther canals short; stigma processes oblong-pyriform, diverging.

Myanmar.— Shan State [Taunggyi District, *Abdul Khalil s.n.* (holotype CAL)]. [1 record]

Distribution.— Endemic; so far only known from the type collection.

Ecology and phenology.— Not recorded.

Notes.— The type at CAL is mounted onto four sheets, most of these with drawings of flower parts. The name of the species was misspelt ‘*massoniana*’ in the protologue while it is correct

on the labels of the four herbarium specimens and also in a description attached to one of them, but the incorrect name was adopted by most later workers. The species is named after Reverend F. Mason who wrote the book in 1883 where Parish published his treatment of Burmese orchids.

On the herbarium labels of two sheets the flower colour is given as blue, but this may be an error as 'blue' was scratched out on one of the other sheets. A blue flower colour is also unlikely as it is otherwise unknown in Asian species of *Habenaria*.

35. *Habenaria fulva* Tang & F.T.Wang, Bull. Fan Mem. Inst. Biol. 7: 138. 1936; Seidenfaden, Dansk Bot. Ark. 31(3): 122, fig. 76. 1977; Chen & Cribb in Chen *et al.*, Fl. China 25: 159. 2009. Type: China, Yunnan, Szemao, 3,000 ft, Aug. 1928, *Henry 13951* (holotype **K** [K000827014!]; isotype **NY** [04094779!]).

Terrestrial herbs, 21–40 cm tall, largely glabrous except for the floral bracts which are marginally ciliate. *Underground tubers* oblong, 1–2 × 0.5–1 cm. *Stems* terete, erect. *Leaves* 3–5, cauline in the lower half of the stem, lanceolate-oblong, 4–8 × 0.6–1.8 cm, acute. *Inflorescences* semi-dense or dense, few-to many-flowered; rachis mostly ca 6 cm long; floral bracts narrowly lanceolate, mostly longer than the flower, acuminate. *Flowers* yellowish-brown or yellow. *Pedicel and ovary* cylindric-fusiform, 8–10 mm long. *Sepals* obtuse; median sepal concave, forming a hood together with the petals, narrowly ovate, 6.5–8 × 3.5–4 mm; lateral sepals lanceolate-oblong, ca 9 × 3 mm. *Petals* obliquely lanceolate, ca 8 × 2.5 mm, acuminate. *Lip* ca 10 mm long, deeply 3-lobed from the base, lobes linear, similar; spur cylindric, 3–5 mm long, much shorter than the sepals, distal third clavate. *Column*: anther erect with narrow connective, anther canals short; stigma processes about 2 mm long.

Myanmar.— Shan State [Taunggyi District, 1,375 m, 16 Sept. 2015, *Baba et al.* 103372 (**MBK**); same locality, 1,565 m, 19 Sept. 2015, *Baba et al.* m-588 (**MBK**); Loilen District, 915–1,370 m, 14 Aug. 1911, *Robertson 428* (**K**)]. Mandalay Region [Pyinoolwin District, 1,035 m, 1 Oct. 1934, *Foss s.n.* (**K**); same locality, 1,065 m, *Samuel 13580* (**K**)]. [5 records]

Distribution.— Myanmar and south-western China.

Ecology and phenology.— Habitat information is available in a single specimen from Myanmar which was growing 'in longish grass in downs'. The elevation where the species has been collected ranges from 915 to 1,565 m. In China, plants of this species occur in forests at 900–1,000 m (Chen & Cribb, 2009). Flowering in Myanmar occurs mostly between August and the beginning of October, which largely corresponds with the flowering time in China.

36. *Habenaria avana* Hook.f., Fl. Brit. India 6: 148. 1890; Grant, Orchids Burma: 331. 1895; Seidenfaden, Dansk Bot. Ark. 31(3): 122, fig. 77. 1977; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 76. 2009; Kurzweil in Fl. Thailand 12(1): 87, fig. 46. 2011. Type: Myanmar, Mandalay Region, Kyaukse District, Ava, *Burneys.n.* (holotype **CAL** [CAL0000000770!]; icon. **K!**).

Terrestrial herbs, slender, 25–30 cm tall, glabrous. *Leaves* 4–7, cauline and scattered along the stem, narrowly lanceolate, up to 11.5 × 1.5 cm, acute. *Inflorescences* dense, many-flowered; rachis ca 10 cm long; floral bracts narrowly lanceolate, mostly slightly longer than the flowers, up to 25 mm long, acuminate. *Flowers* about 15 mm in diameter, white. *Pedicel and ovary* about 12 mm long. *Sepals* obtuse or subacute; median sepal erect, connivent with the petals, elliptic or suborbicular, 7–7.8 × ca 4 mm; lateral sepals narrowly ovate, 6.4–8 × 3.3–4 mm. *Petals* falcate, triangular-oblong, about 6 × 3.9 mm, obtuse. *Lip* 10–16 mm long, deeply 3-lobed above a basal claw of about 4.5 mm, with oblong or linear lobes; midlobe 5.5–10 mm long, margins deflexed; side lobes mostly 5.8–6.3 mm long; spur cylindric, 7.1–8 mm long, distally clavate, geniculate in the middle. *Column* 2.7–2.8 mm long; anther erect with narrow connective, anther canals about 0.5 mm long; stigma processes ca 2.5 mm long.

Myanmar.— Mandalay Region [Kyaukse District, *Burney s.n.* (holotype **CAL**; icon. **K**)]. [1 record]

Distribution.— Known to us from only two collections; the type specimen from central Myanmar and one other collection from northern Thailand.

Ecology and phenology.— No habitat information is known in the type specimen from Myanmar. The Thai specimen was collected in an old rice field at 800 m elevation (Seidenfaden, 1977; Kurzweil,

2009, 2011). The time of flowering was not recorded in either the Myanmar or the Thai specimen.

Notes.— Similar to *Habenaria marginata* Colebr. in its flower structure, but well distinguished in foliage and flower colour.

37. *Habenaria marginata* Colebr. in W.J.Hooker, Exot. Fl. 2: t. 136. 1824; Hooker, Fl. Brit. India 6: 150. 1890; Grant, Orchids Burma: 339. 1895; Seidenfaden, Dansk Bot. Ark. 31(3): 122, fig. 78. 1977; Pearce & Cribb, Orch. Bhutan: 150. 2002; Chen & Cribb in Chen *et al.*, Fl. China 25: 159. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 75. 2009; Raskoti, Orch. Nepal: 155 (incl. colour photo). 2009; Chen *et al.*, Fl. China 25, Illustrations: fig. 199.3–5. 2010; Kurzweil in Fl. Thailand 12(1): 124, fig. 69. 2011.— *Pecteilis marginata* (Colebr.) M.A.Clem. & D.L.Jones, Austral. Orchid Rev. 83(6): 52. 2018. Type: India, icon. *Colebrooke* 179 (holotype **K**).

— *Habenaria promensis* Lindl., Gen. Sp. Orchid. Pl.: 320. 1835; Parish in Mason, Burma – People and Productions, vol. II (Botany): 201. 1883. Type: Myanmar, Bago Region, Pyay District, Mt Prome, 1826, *Wallich s.n.*, *Numer. List no. 7033* (holotype **K-LINDL!**; isotype **K-W** [K001126617!]).

— *Habenaria aurantiaca* Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 418. 1925; Seidenfaden & Smitinand, Orch. Thailand I: 28, fig. 19. 1959. Type: Thailand, Chiang Mai Province, paddy fields at the foot of Doi Suthep, 26 Nov. 1912, *Kerr* 125 (holotype **K** [K000364332!, K000364333!]).

Terrestrial herbs, slender, 7–37 cm tall, glabrous except for ciliate margins of sterile bracts and floral bracts. *Underground tubers* ellipsoid, 1.9–4 × 0.7–2.5 cm. *Stems* terete, erect. *Leaves* 3–7, cauline in the lower half of the stem, oblong-lanceolate, 3–9 × 0.8–2.5 cm, acute or subacute. *Inflorescences* dense, 2- to 20-flowered; rachis 1.6–10 cm long; floral bracts ovate-lanceolate, usually 8–15 × 2.5–4 mm, acuminate. *Flowers* 9–13 mm in diameter, yellow, orange-yellow or sometimes greenish-yellow, or sepals green and petals and lip yellow. *Pedicel and ovary* cylindric-fusiform, 10–15 mm long. *Sepals* obtuse or subacute; median sepal erect, forming a hood together with the petals, concave, broadly ovate, 5–7.5 × 3.5–6 mm; lateral sepals reflexed, lanceolate, 5–10 × 2–4 mm. *Petals* ovate-triangular,

4.7–7.3 × 2–5 mm, acute or obtuse. *Lip* 9–16 mm long, spreading, deeply 3-lobed above an unlobed base of 3–5 mm, lobes oblong or linear; midlobe mostly 6.7–10 mm long, margins deflexed; side lobes 6–10 mm long; spur cylindric, 7–13 mm long, shorter than pedicel plus ovary, distally clavate, slightly geniculate in the middle. *Column* 2.5–3 mm long; anther erect or suberect, anther canals about 0.6 mm long; stigma processes ca 2.5 mm long.

Myanmar.— Shan State [Taunggyi District, fide Aung *et al.* (2020: 87); southern part, Nov. 1909, *Micholitz s.n.* (**K**)]. Bago Region [Pyay District, *Wallich s.n.*, *Numer. List no. 7033* (holotype of *Habenaria promensis* Lindl. **K-LINDL!**; isotype **K-W**); same locality, *Parish* 225 (not located), fide Parish (1883: 201; as *H. promensis*)]. [4 records]

Distribution.— Pakistan, northern India, Himalayas, Bhutan, Bangladesh, Myanmar, Thailand and south-western China.

Ecology and phenology.— No information on the habitat is available in the few specimens from Myanmar. In other parts of the distribution area, the species is found in deciduous forest, grassland at forest margins and in rice field bunds (Pearce & Cribb, 2002; Chen & Cribb, 2009; Kurzweil, 2009, 2011; Raskoti, 2009); some collector labels indicate sandstone as bedrock. Elevations vary throughout the distribution range, mostly ranging from 190–1,500 m; they are somewhat higher in Bhutan at 1,680–1,770 m (Pearce & Cribb, 2002). Flowering in Myanmar has been recorded in only one of the collections, which was flowering in November; in other parts of the distribution area reported between September and November.

38. *Habenaria prazeri* King & Pantl., J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 602. 1897. Type: Myanmar, upper part, 1894, *Prazer s.n.* (holotype **CAL** [CAL0000000715!]). Fig. 7.

Herbs, apparently terrestrial, robust, 50–61 cm tall. *Stems* erect. *Leaves* 5, cauline, in a cluster in the lower third of the stem, lanceolate, 7.6–12.7 × 1.9–2.9 cm, acuminate, shortly petioled. *Inflorescences* lax, ca 20-flowered; rachis about 18 cm long; floral bracts linear, as long as or slightly longer than pedicel plus ovary, to 10 mm long. *Flowers* ca 10 mm in diameter, colour not known. *Pedicel and ovary* slender cylindric-fusiform, 9–11 mm long, shortly

stalked, obscurely beaked. *Sepals*: median sepal erect, concave, ovate, about 5 mm long, obtuse; lateral sepals recurved, slightly longer and narrower, acute. *Petals* smaller than the median sepal, obliquely ovate-lanceolate, acute. *Lip* as long as the lateral sepals, unlobed with lower part transversely elliptic, slightly concave, upper part a fleshy linear tooth; alternatively, the lip could also be interpreted as shallowly 3-lobed with basal semi-elliptic side lobes; spur stout, cylindric, about half as long as pedicel plus ovary, clavate, curved forwards. *Column*: anther thecae parallel, connective narrow, anther canals up-curved.

Myanmar.— Upper Myanmar [*Prazer s.n.* (holotype CAL)]. [1 record]

Distribution.— Endemic; so far only known from the type collection.

Ecology and phenology.— Not recorded.

Notes.— The lip shape, depicted in a drawing on the type sheet, is very unusual in the genus *Habenaria* with its broadly elliptic basal part and the tooth-like linear upper part, but is similar to what is found in some species of the genus *Platanthera* and may indicate that the species should be transferred to that genus. The stigma structure is very critical in tribe Orchideae (Pridgeon *et al.*, 2001) but is not known in *Habenaria prazeri*. A morphological re-examination and a molecular study of the specimen will prove difficult given the poor material, and would therefore require a re-collection of this species.

39. *Habenaria linearis* King & Pantl., J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 602. 1897. Type: Myanmar, southern Shan State, Saga, 1893, *Abdul Khalil s.n.* (holotype CAL [acc. no. 463144 & 463145!]). Fig. 8.

Terrestrial herbs, robust, 38–70 cm tall. *Stems* terete, erect. *Leaves* ca 5, cauline and scattered along the stem, linear or very narrowly lanceolate, 5–10 × 0.5–1 cm, acuminate. *Inflorescences* lax, 3–6-flowered; rachis 3.8–5 cm long; floral bracts linear-lanceolate, longer than pedicel plus ovary, acuminate, ciliolate. *Flowers* ca 19 mm in diameter, white. *Pedicel and ovary* very slender, subsessile, long-beaked. *Sepals* similar, about 10–11 mm long, lanceolate, subacute; median sepal conduplicate, apparently erect; lateral sepals spreading, slightly falcate. *Petals* oblong,

slightly shorter than the sepals, fleshy, obtuse. *Lip* unlobed, oblong-lanceolate, slightly longer than the sepals, with a slender basal claw, obtuse, edges entire and decurved, the lower lip surface with a prominent central keel over the entire length; spur incurved, longer than ovary plus pedicel, clavate.

Myanmar.— Shan State [southern part, *Abdul Khalil s.n.* (holotype CAL)]. [1 record]

Distribution.— Endemic; so far only known from the type collection.

Ecology and phenology.— Not recorded.

Notes.— Similar to *Habenaria mandersii* but differing by narrower leaves, fewer-flowered and laxer inflorescences, a clawed lip base and the absence of a basal tongue on the lip.

40. *Habenaria mandersii* Collett & Hemsl., J. Linn. Soc., Bot. 28: 133. 1890; Hook.f., Fl. Brit. India 6: 146. 1890; Grant, Orchids Burma: 338. 1895; Seidenfaden, Dansk Bot. Ark. 31(3): 126, fig. 80a–c. 1977; Seidenfaden, Opera Bot. 114: 67, fig. 34. 1992; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 77. 2009; Averyanov, Turczaninowia 13(2): 62, fig. 41. 2010; Kurzweil in Fl. Thailand 12(1): 121, fig. 68, pl. IX-1. 2011.— *Kraenzlinorchis mandersii* (Collett & Hemsl.) Szlach., Orchidee (Hamburg) 55: 58. 2004. Type: Myanmar, Shan Hills, 1888, *Manders s.n.* (lectotype K[K000247450!], first step designated by Seidenfaden, 1977; second step designated by Kurzweil, 2009); Myanmar, Shan Hills, Taunggyi District, 1,340 m, Aug. 1888, *Manders s.n.* (possibly isoelectotype CAL [acc. no. 462351!]).

Terrestrial herbs, robust, 29–55 cm tall, glabrous except bract margins sometimes hairy. *Stems* terete, erect. *Leaves* 4–6, cauline, in the lower quarter of the stem, lanceolate-elliptic, 4–12 × 1–2.3 cm, subacute or acute. *Inflorescences* semi-dense or lax, few- to many-flowered; rachis 4–10 cm long; floral bracts lanceolate, mostly longer than pedicel plus ovary, 17–25 × 3–6 mm, acute. *Flowers* to 19 mm in diameter, white. *Pedicel and ovary* 15–22 mm long, beaked. *Sepals*: median sepal erect, forming a hood together with the petals, concave, elliptic-ovate, 6.5–10.5 × 3.5–5.5 mm, subacute or obtuse; lateral sepals similar, spreading, 6.8–11 × 3–4.6 mm. *Petals* elliptic-lanceolate or oblong, 7–11.5 × 1.5–2

mm, obtuse or subacute. *Lip* 8–16.5 × 2–3 mm, unlobed, narrowly oblong-lanceolate, obtuse, margins decurved; lip base with an erect tongue 1.5–2.5 mm tall, with obscure rounded lateral bulges but not with prominent lateral teeth, with laminal flange over its entire length, apex of tongue obtuse; spur cylindric, 20–47 mm long, longer than pedicel plus ovary, distal third slightly clavate. *Column* 3–4 mm long; anther canals 3–5 mm long, angled or curved upwards; stigma processes 4–5 mm long, straight or bent upwards.

Myanmar.— Shan State [Taunggyi District, *Manders s.n.* (possible isolectotype **CAL**); Loilen District, 1,370 m, 4 Aug. 1911, *Robertson 393* (**K**); district not known, *Manders s.n.* (lectotype **K**)]. Mandalay Region [Mandalay District, *Anderson s.n.* (**CAL** [acc. no. 462350]); same locality, *without collector s.n.* (**CAL** [acc. no. 462359])]. [4 or 5 records]

Distribution.— Myanmar, Thailand, Laos, Vietnam and Cambodia.

Ecology and phenology.— Habitat information in Myanmar has been recorded in a single collection which was made ‘in clay soil in hollows close to the lake’ at an elevation of 1,370 m; in addition, an elevation of 1,340 m was indicated in another specimen. In Thailand, plants of this species are found in deciduous dipterocarp, oak and pine forest, often in marshy forest clearings, at 280–1,025 m (Kurzweil, 2009, 2011). Flowering in Myanmar has been recorded in August; in Thailand, flowering of *Habenaria mandersii* has been recorded from August to November.

Notes.— This species is sometimes mistaken for a short-spurred form of the similar *Habenaria hosseusii* Schltr.

41. *Habenaria denticulata* Tang & F.T.Wang, Bull. Fan Mem. Inst. Biol. 7: 137. 1936; Seidenfaden, Dansk Bot. Ark. 31(3): 126, fig. 80d–e. 1977; Seidenfaden, Opera Bot. 114: 67, fig. 35. 1992; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 78. 2009; Kurzweil in Fl. Thailand 12(1): 108. 2011 (in obs.).— *Kraenzlinorchis denticulata* (Tang & F.T.Wang) Szlach., Orchidee (Hamburg) 55: 58. 2004. Type: Myanmar, Mandalay Region, Meiktila District, Taunggyigon Reserve, 670 m, 7 Oct. 1929, *Tha Myaing 263* (holotype **K** [K000247486!];

isotype **E** [E00743160!]).

Terrestrial herbs, robust, 32–50 cm tall, glabrous except for the margins and midribs of the sterile bracts and floral bracts. *Stems* erect, terete in the lower part and several-angled in the upper part. *Leaves* 3–8, cauline, mainly in the lower part of the stem, lanceolate-elliptic or oblong-lanceolate, 4.5–7.5 × 0.8–1.5 cm, acute. *Inflorescences* semidense or lax, to 15-flowered; rachis 7–15 cm long; floral bracts lanceolate, 25–35 × 4–5 mm, longer than ovary plus pedicel, acute. *Flowers* 21–23.5 mm in diameter, colour not known in the type specimen, the flowers of the collection *Saw Lwin et al. MPO 030* were white. *Pedicel and ovary* cylindric-fusiform, 23–27 mm long, minutely papillose, with a beak about 7 mm long. *Sepals* ovate-lanceolate; median sepal reflexed, 9.7–12 × ca 5.5 mm, subacute or acute; lateral sepals spreading, 10–12 × 4–5.5 mm, subacute. *Petals* lorate, 10–12.5 × 2.5–2.8 mm, obtuse or subacute. *Lip* unlobed, narrowly oblong-lanceolate, 17–20 × 2.6–3 mm; in front of the spur entrance a tongue ca 3 mm long with prominent lateral teeth, its laminate flange a minute bulge, apex of the tongue bilobed; spur cylindric, 50–70 mm long, slightly clavate, obtuse. *Column* ca 4.5 mm long; anther suberect, connective narrow, anther canals 6–8 mm long, curved upwards; stigma processes about 6 mm long.

Myanmar.— Mandalay Region [Myingyan District, Nov. 2010, *Saw Lwin et al. MPO 030* (**SING**); Meiktila District, *Tha Myaing 263* (holotype **K**; isotype **E**)]. [2 records]

Distribution.— Central Myanmar, ? Thailand, Laos and Cambodia.

Ecology and phenology.— Habitat information has not been provided in Myanmar material, and is also not available in the single Thai specimen which comes from a local market. The elevation of the type locality in central Myanmar is 670 m. Flowering in Myanmar takes place in October and November; the only Thai specimen known was flowering in October (Kurzweil, 2009).

42. *Habenaria hosseusii* Schltr., Repert. Spec. Nov. Regni Veg. 2: 81. 1906; Seidenfaden & Smitinand, Orch. Thailand I: 22, fig. 14; IV(2): 725. 1959–1965; Seidenfaden, Dansk Bot. Ark. 31(3): 130, fig. 81. 1977; Kurzweil, Thai Forest

Bull., Bot. (Special Issue): 79, fig. 21. 2009; Kurzweil in Fl. Thailand 12(1): 108, fig. 59, pl. VII-1. 2011. — *Kraenzlinorchis hosseusii* (Schltr.) Szlach., Orchidee (Hamburg) 55: 58. 2004. Type: Thailand, Tak Province, summit of Wang Chao, 150 m, 3 Oct. 1904, *Hosseus* 77 (lectotype **K** [K000364327!], designated by Kurzweil, 2009; isolectotypes **BM** [BM000033433!], **P** [P00426991!], **M** [M-01687921!]).

Terrestrial herbs, robust, 27–74 cm tall, glabrous except sterile bracts and floral bracts sometimes ciliate on the margins. *Leaves* 3–9, cauline, mainly in the lower stem portion, narrowly lanceolate-elliptic, mostly 6–16 × 0.8–2.8 cm, acute, margins entire or pronounced papillate. *Inflorescences* lax, 4- to 15-flowered; rachis 3–18 cm long; floral bracts lanceolate, shorter or longer than pedicel plus ovary, mostly 12–30 × 3–6 mm, acute. *Flowers* 15–25 mm in diameter, white, tips of perianth lobes and spur sometimes greenish. *Pedicel and ovary* 21–30 mm long. *Sepals*: median sepal erect, forming a hood together with the petals, concave, elliptic-oblong, mostly 8.5–14 × 4–5 mm, subacute or obtuse; lateral sepals similar but spreading. *Petals* erect, oblong, mostly 8.5–14 × 1.5–2.6 mm, obtuse. *Lip* mostly 10–17 × 1–2 mm, unlobed, narrowly oblong-lanceolate; with a prominent 2–3 mm long tongue in front of the spur mouth, with lateral teeth, laminal flange of tongue apparently in distal half of the tongue only, tongue apically obtuse or mucronate; spur cylindric, 48–100 mm long, much longer than pedicel plus ovary, distally clavate. *Column* 3–4 mm long; anther with narrow connective, anther canals 3–5 mm long; stigma processes 3–6 mm long.

Myanmar.— Shan State [Taunggyi District, 1,130 m, 23 Sept. 2015, *Kilgour et al. m-622* (**MBK**)]. ? Kayin State [? Kawkareik District, 14 Aug. 2011, *Phelps JP 3045* (**BKF** [s]). [2 records]

Distribution.— Myanmar and Thailand. This is a Thai near-endemic, known from 25 collections in this country. Only two collections are currently known from Myanmar.

Ecology and phenology.— One of the two collections from Myanmar was made in grassland over limestone at 1,130 m; no habitat information was provided in the other collection. In neighbouring Thailand, the plants seem to be quite common in the north-west of the country (Seidenfaden, 1977), and grow in primary and secondary forest over shale,

limestone and granite at elevations of 50–900 m (Kurzweil, 2009, 2011). The two collections from Myanmar were flowering in August and September; Thai plants are flowering mainly from July to September, rarely as early as June or as late as November.

Notes.— Similar to *Habenaria mandersii* but differing by longer lip spurs (*H. mandersii*: 20–47 mm long; *H. hosseusii*: 48–100 mm long). Also the structure of the basal lip tongue appears to be a differentiating character (*H. mandersii*: tongue with obscure rounded lateral bulges but not with prominent lateral teeth and with a laminal flange over its entire length; *H. hosseusii*: tongue with prominent lateral teeth and a laminal flange apparently only in its distal half).

43. *Habenaria rodgeri* W.W.Sm. & Banerji, Rec. Bot. Surv. India 6: 34. 1914. Type: Myanmar, Mandalay Region, Pyinoolwin District, Mogok, 305 m, Sept. 1910, *Rodger 201* (holotype **CAL**; isotype **K** [K000827006!]). Fig. 5B & 9.

— *Habenaria rhodocheila* auct. plur., non Hance

— *Habenaria erichmichelii* auct., non Christenson: Tanaka *et al.*, Acta Phytotax. Geobot. 61: 164. 2011.

Terrestrial or lithophytic herbs, slender, 17–25 cm tall. *Leaves* 4–5, oblong-elliptic, in a basal rosette and adpressed to the soil, 6.3–10 × 3–5 cm, obtuse or acute, green or brownish-green with prominent pale dots or mottling, glabrous. *Inflorescences* lax, 6–12-flowered; rachis 6–8 cm long, subglabrous; floral bracts ovate, much shorter than pedicel plus ovary, 10–12.5 × 5 mm, long-acuminate. *Flowers* pink. *Pedicel and ovary* narrowly fusiform, 20–25 mm long, subglabrous. *Sepals* glabrous or outsides finely hairy or scaly; median sepal erect, forming a hood together with the petals, concave, ovate, 7–10 mm long, obtuse; lateral sepals similar but recurved. *Petals* linear-spatulate, to 8.5 × 2.5 mm, glabrous. *Lip* to 17 × 20 mm, 3-lobed, finely hairy or scaly; midlobe obovate, to 13 × 12 mm, apically bifid; side lobes oblong, to 10 mm long, obtuse; spur slender-cylindric, to 45 mm long, much longer than pedicel plus ovary. *Column* to 4 mm long; anther erect with narrow connective, anther canals about as long as the stigma processes; central rostellum lobe very prominent and half as tall to nearly as tall as the anther.

Myanmar.— Mandalay Region [Pyinoolwin District, *Rodger 201* (holotype **CAL**; isotype **K**); same locality, 1,065 m, *Samuel 13582* (**K**); Myingyan District, 15 Sept. 2002, *Khin Myo Htwe 024088A* (**MBK**, **TI**); same locality, *Saw Lwin s.n.* (**SING**, **SING** [s]); same locality, Sept. 2005, *Kurzweil s.n.*, photographic record]. Chin State [Falam District, 1,830 m, *Daun 98* (**K**); Mindat District, 1,370 m, 15 Sept. 1956, *Maung Gale-2 5785* pro parte (**RAF**); same locality, 900 m, 21 Sept. 1956, *Kingdon-Ward 22700* (**BM**)]. [8 records]

Distribution.— Endemic to central and western Myanmar.

Ecology and phenology.— Growing in forest; in one collection the notes on the herbarium label make reference to rich black humus. Elevation has been recorded as 305–1,830 m. Flowering has been reported in September.

Notes.— With its basal rosette of 4–5 oblong-elliptic and distinctly pale-mottled leaves which are adpressed to the ground, this is a look-alike of *Habenaria carnea* Gower from Peninsular Thailand and Malaysia, but this species differs markedly in the shape of the petals. On account of the latter feature, *H. rodgeri* has been synonymised with the widespread *H. rhodocheila* Hance although this species has a different foliage (leaves narrower and green, cauline in the lower stem part). A detailed taxonomic study of the *H. rhodocheila-carnea* group is needed, but as long as this is not available we prefer to maintain *H. rodgeri* as a separate species.

44. *Habenaria aitchisonii* Rchb.f., Trans. Linn. Soc. London, Bot., ser. 2, 3: 113. 1888; Hooker, Fl. Brit. India 6: 152. 1890 [as *aitchisoni*]; Pearce & Cribb, Orch. Bhutan: 154. 2002; Chen & Cribb in

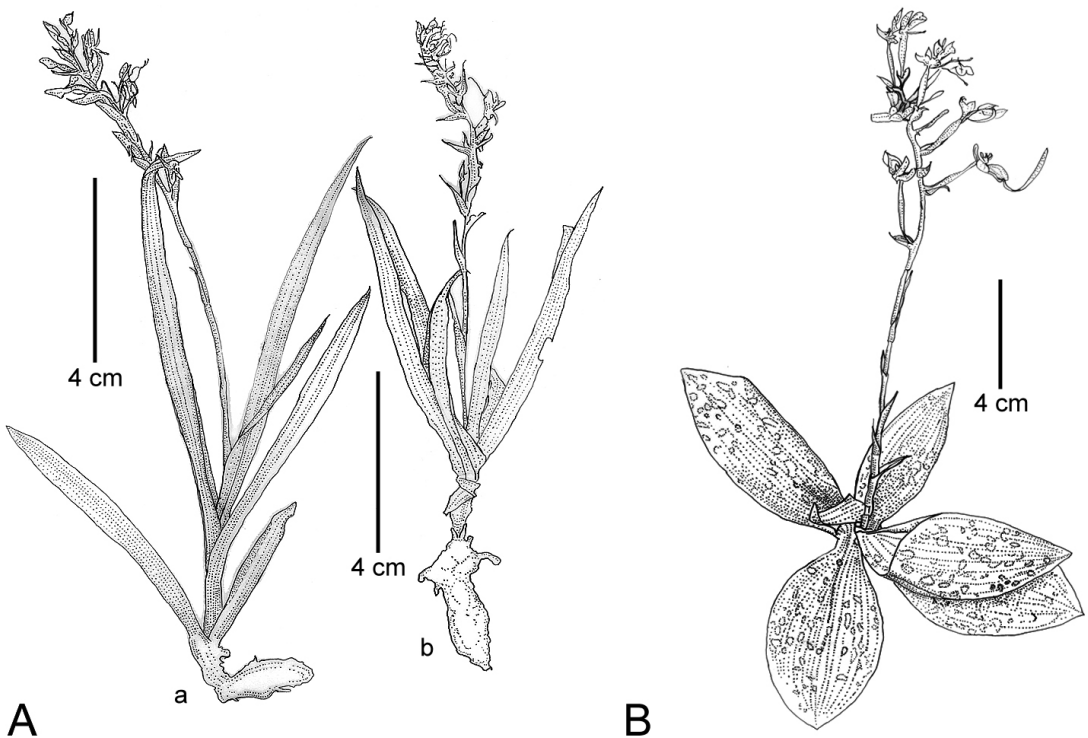


Figure 5. A. *Habenaria ditricha* Hook.f.: a–b. habit. a from *Lobb 350* ‘Moulmein’ (lectotype **K**); b from *Lobb 350* ‘Java’ (holotype of *H. javanica* Kraenzl.). B. *H. rodgeri* W.W.Sm. & Banerji: habit. From *Rodger 201* (holotype **CAL**). All drawn by C. Sathish Kumar.

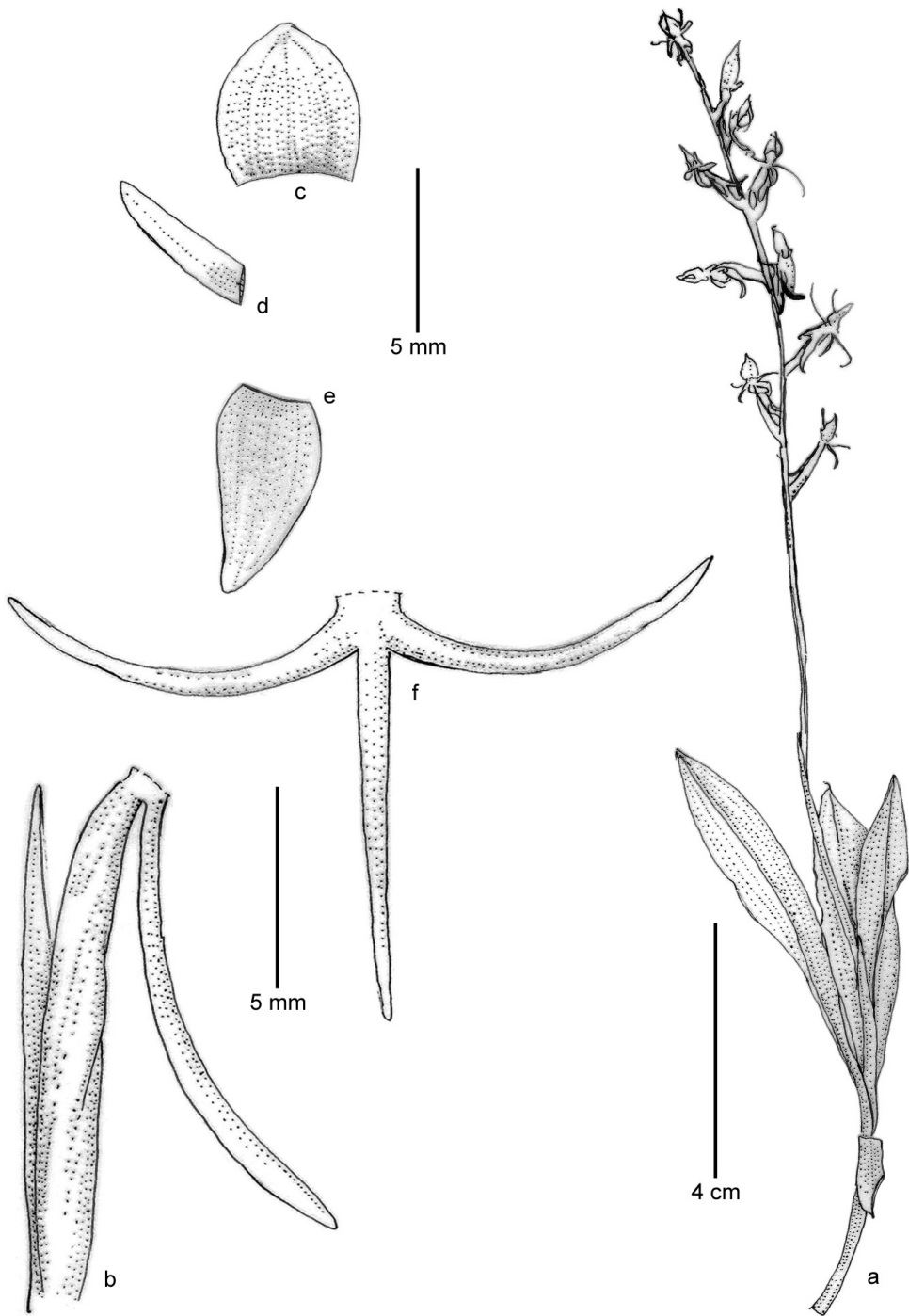


Figure 6. *Habenaria masoniana* King & Pantl.: a. habit; b. ovary, spur and floral bract; c. median sepal; d. petal; e. lateral sepal; f. lip. From Abdul Khalil s.n. (holotype CAL). All drawn by C. Sathish Kumar.

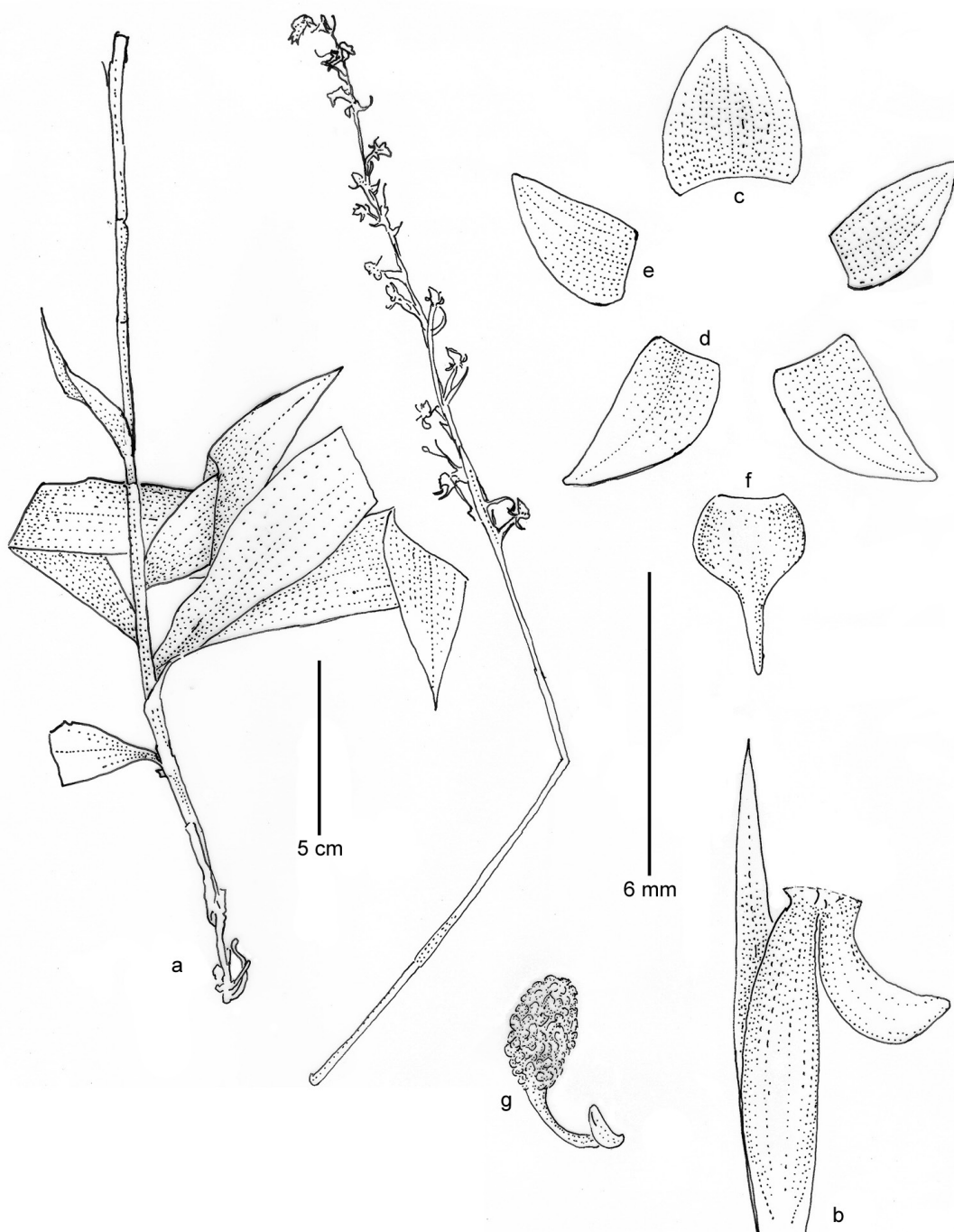


Figure 7. *Habenaria prazeri* King & Pantl.: a. habit; b. floral bract, ovary and spur; c. median sepal; d. lateral sepal; e. petal; f. lip; g. pollinarium. From *Prazer* s.n. (holotype CAL). All drawn by C. Sathish Kumar.

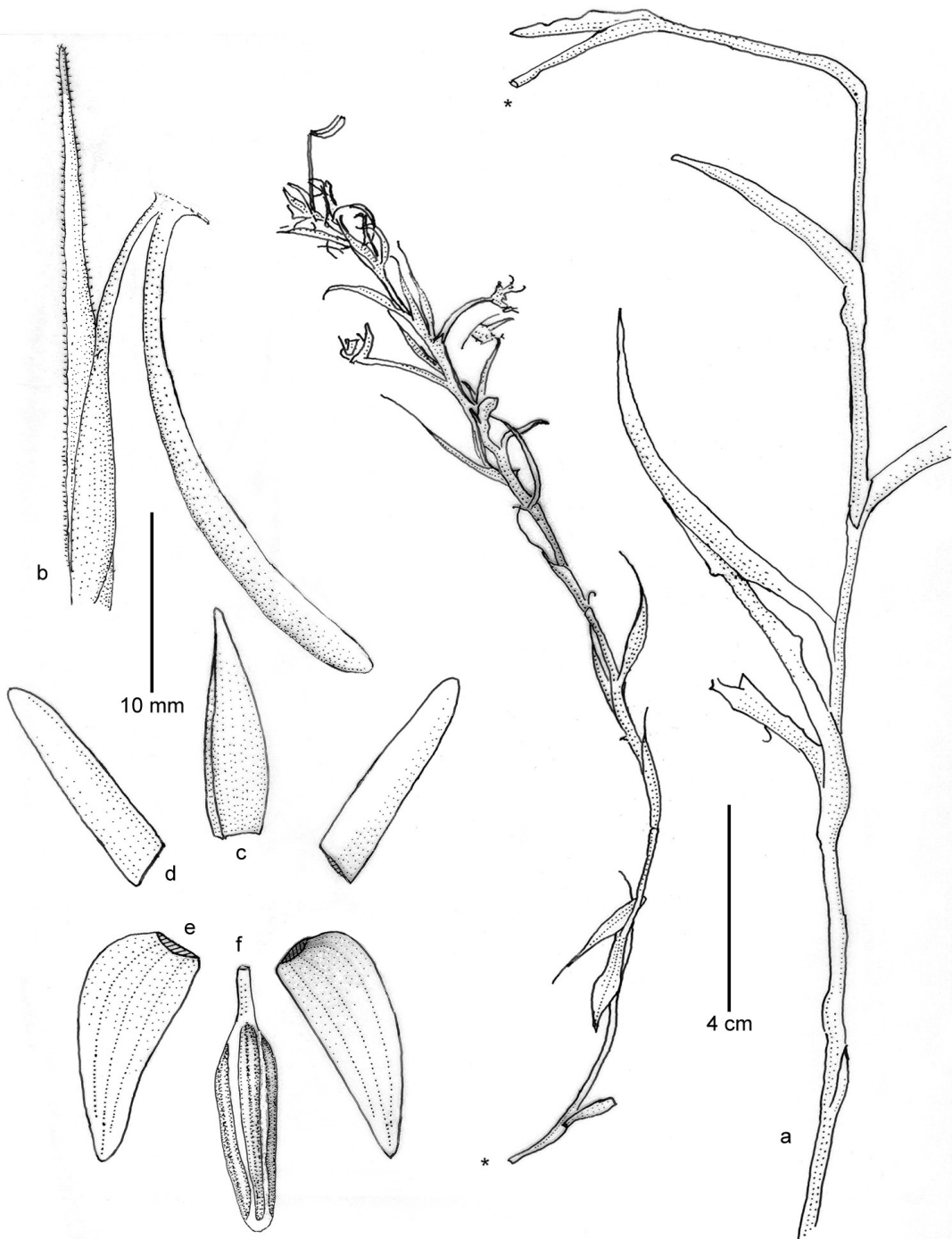


Figure 8. *Habenaria linearis* King & Pantl.: a. habit; b. floral bract, ovary and spur; c. median sepal; d. petal; e. lateral sepal; f. lip underside. The scale bar in b–f is only approximate, as neither the protologue nor the type sheet give exact measurements of sepals, petals and lip. From *Abdul Khalil s.n.* (holotype CAL). All drawn by C. Sathish Kumar.

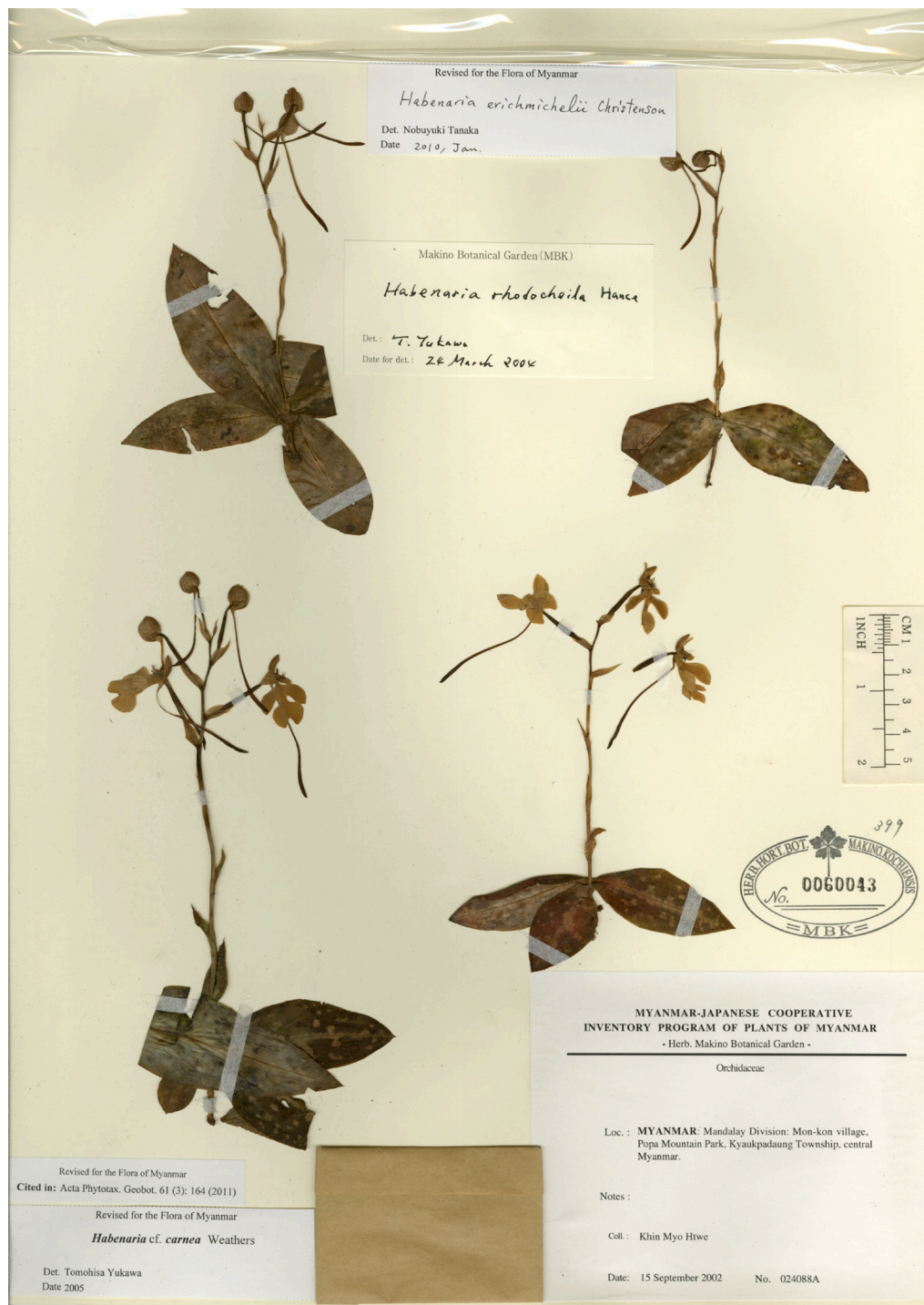


Figure 9. Herbarium sheet of *Habenaria rodgeri* W.W.Sm. & Banerji in the Herbarium **MBK** (Makino Botanical Garden, Kochi, Japan). Reproduced here courtesy of **MBK**. Photo: Santi Waththana.

Chen *et al.*, Fl. China 25: 149. 2009; Chen *et al.*, Fl. China 25, Illustrations: fig. 192.4–6. 2010; Pandey & Jin, PhytoKeys 175: 123. 2021. Type: Afghanistan (now Pakistan), Darban Valley, Kuram District, 2,280 m, 9 Aug. 1880, *Aitchison 413* (holotype **K** [K000247484!]; isotype **GH** [00256482!]). [largely fide Pandey & Jin (2021a: 124)]

— *Habenaria dicerias* Schltr., Notes Roy. Bot. Gard. Edinburgh 5: 101. 1912. Type: China, Yunnan, Lichiang Range, 9,000–10,000 ft, Oct. 1906, *Forrest 3074* (holotype **E** [E00381986!]; isotype **P** [P00426380!]).

— *Habenaria bihamata* Kraenzl., Repert. Spec. Nov. Regni Veg. 17: 106. 1921. Type: China, Yunnan, Pe yen tsin, *Ten s.n.* (**C** [C10016231!]).

— *Habenaria pubicaulis* Schltr., Acta Horti Gothob. 1: 139. 1924.— *Habenaria dicerias* Schltr. var. *pubicaulis* (Schltr.) Soó, Ann. Hist.-Nat. Mus. Natl. Hung. 26: 370. 1929. Type: China, Sichuan, 3,100 m, 30 July 1922, *Smith 3858* (holotype **UPS** [V-091292]; isotypes **PE** [01516965], **E** [E00381983!], **LD** [1073030!], **S** [acc. no. S07-285!]). [largely fide Pandey & Jin (2021a: 123)]

— *Habenaria wolongensis* K.Y.Lang, Acta Phytotax. Sin. 22: 314. 1984. Type: China, Sichuan, Wolong, 2,200 m, 1982, *Lang et al. 1528* (lectotype **PE** [01147127], designated by Pandey & Jin, 2021b; isolectotype: **PE** [01147128]). [largely fide Pandey & Jin (2021a: 123)].

Terrestrial herbs, slender or robust, 10–50 cm tall. *Underground tubers* ellipsoid or oblong, 1–2.5 × 0.8–1.5 cm. *Stems* terete, erect, papillate-pubescent. *Leaves* 2, basal and adpressed to the soil, subopposite, ovate-orbicular, 2–7 × 1.5–6 cm, acute. *Inflorescences* laxly to densely several- to 40-flowered, subsecund; rachis 1.5–15 cm long, papillose; floral bracts ovate-lanceolate, about equally long or shorter than pedicel plus ovary, acuminate. *Flowers* small, green or yellowish-green. *Pedicel and ovary* 7–10 mm long, papillate-hairy. *Sepals* acute or obtuse; median sepal erect, forming a hood together with the petals, concave, ovate, 3–5 × 2.5–3.5 mm; lateral sepals reflexed, ovate-oblong, 3.5–5.5 × 2–3 mm. *Petals* shallowly 2-lobed; posterior lobe falcate-lanceolate, 3–5 × 1.5–2 mm; anterior lobe a tooth ca 0.5 mm long. *Lip* deeply 3-lobed with linear lobes; midlobe 5–9 mm long; side lobes retrorse, 6–12 mm long; spur shorter than pedicel plus ovary, cylindric, 6–9 mm long,

distal part clavate. *Column* short; anther thecae diverging, separated by a wide connective, caudicles of the pollinia short; stigma processes subclavate.

Myanmar.—Kachin State [Myitkyina District, Chipwi Township, 2,500 m, 12 Sept. 1919, *Farrer 1307* (**E**)]. [1 record]

Distribution.—Afghanistan, Pakistan, northern India, Himalayas, Bhutan, northern Myanmar and south-western China.

Ecology and phenology.—The only known specimen from Myanmar was collected in coppice over limestone at an elevation of 2,500 m. In China, the species is found in forest, thicket and grassland, reported from elevations ranging from 2,100 to 4,300 m (Chen & Cribb, 2009). Plants in Bhutan and Sikkim were reported in open *Larix-Juniperus* forest over sandstone and growing under *Rhododendron lepidotum* (Pearce & Cribb, 2002). In Pakistan mainly growing in forest up to 3,500 m ('Flora of Pakistan' website). The Myanmar specimen was flowering in September; in other mainland Asian countries the flowering of *Habenaria aitchisonii* occurs from July to September.

Notes.—This and the following four species belong to *Habenaria* sect. *Diphyllae* (Kränzlin 1892: 147), a well-defined group characterised by basal leaves, 3-lobed lips and 2-lobed or unlobed petals. The *H. diphylla* group is well represented in tropical and subtropical Asia. Some of the species are very similar to each other and do not appear to be distinct. The group has not yet benefitted from a careful study in the region and is very much in need of taxonomic work. However, a subgroup was recently revised in the Pan-Himalayas (Pandey & Jin, 2021a).

45. *Habenaria diphylla* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 262. 1850. Type: India, Bombay, *Dalzell s.n.* (lectotype **K**, designated by Bramhadande & Nandikar, 2023). Syntypes: **K**, **GH** [GH00099782!]).

— *Habenaria josephi* Rchb.f., Trans. Linn. Soc. London, Bot., ser. 2, 3: 114. 1888; Pandey & Jin, PhytoKeys 175: 114. 2021.— *Habenaria aitchisonii* Rchb.f. var. *josephi* (Rchb.f.) Hook.f., Fl. Brit. India 6: 152. 1890.— *Habenaria diphylla* Dalzell var. *josephi* (Rchb.f.) N.Pearce & P.J.Cribb, Edinburgh J. Bot. 58: 114. 2001; Pearce & Cribb, Orch. Bhutan: 155, fig. 41. 2002. Type: India, Sikkim, 12,000–14,000

ft, 23 July 1849, *Hooker 42* (holotype **K** [K000247480!]; isotypes **K**, **GH** [00256484!], **P** [P00370608!], **LE**). [largely fide Pandey & Jin (2021a: 114)]

— *Habenaria clarkei* Kraenzl., Bot. Jahrb. Syst. 16: 148. 1892. Type: India, Sikkim, *Hooker 42* (lectotype **K** [K000247480!], designated by Pandey & Jin, 2021a; isolectotypes **GH** [00256484!], **P**, **LE**). [largely fide Pandey & Jin (2021a: 115)]

— *Habenaria humistrata* Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 419. 1925; Seidenfaden & Smitinand, Orch. Thailand I: 29. 1959; Seidenfaden, Dansk Bot. Ark. 31(3): 131, fig. 83. 1977; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 84, fig. 22. 2009; Kurzweil in Fl. Thailand 12(1): 111, fig. 61, pl. VII-3. 2011. Type: Thailand, Chiang Mai Province, Doi Suthep, open deciduous jungle among grass, 450–1,050 m, 29 Aug. 1901, *Kerr 194* (holotype **K** [K000364326!]; isotypes **L** [L 0061408!], **P** [P00426997!]).

Terrestrial herbs, slender, 7–29 cm tall, glabrous. *Tubers* ellipsoid or ovoid, 0.5–1.5 cm long. *Stems* terete, erect. *Leaves* 2–3, basal and adpressed to the soil, cordate, ovate or reniform, mostly $1.2\text{--}5 \times 1\text{--}5$ cm, acute. *Inflorescences* lax, slender, 1- to 10-flowered; rachis 1–15 cm long; floral bracts lanceolate to ovate, shorter than pedicel plus ovary, $6.8\text{--}11 \times 2\text{--}3.5$ mm, acuminate. *Flowers* 8–15 mm in diameter, greenish-white, greenish-brown or green. *Pedicel and ovary* terete, 8–24 mm long, erect and close to the rachis. *Sepals* subacute or obtuse; median sepal forming a rather open hood together with the petals, concave, ovate, $4.5\text{--}7(9.5) \times 3\text{--}5.5$ mm; lateral sepals reflexed, oblong, mostly $5.2\text{--}8(12) \times 3\text{--}4$ mm. *Petals* linear-lanceolate or triangular-linear, falcate, $5.2\text{--}8.5 \times 1\text{--}2$ mm, acute or subacute. *Lip* 8–15 mm long, deeply 3-lobed, lobes filiform; midlobe 6.8–12 mm long; side lobes inserted at a right angle to the midlobe and longer than it, 10–25 mm long, often curled upwards; spur cylindric, 4.8–16 mm long, shorter than pedicel plus ovary, subclavate, subacute. *Column* 2.8–3.3 mm long; anther with wide connective; stigma processes narrowly clavate, ca 2 mm long.

Myanmar.—Kachin State [district not known, Nov. 1897, *Shaik Mokim s.n.* (**CAL** [acc. no. 462501])]. Shan State [Kengtung District, 1,370 m, July 1909, *MacGregor ? 681* (**E**); district not known,

MacGregor 681 (**CAL** [acc. no. 462500]) (possibly identical with the aforementioned collection)]. Tanintharyi Region [Dawei District, 700 m, Aug. 1961, *Keenan et al.* 758 (**A**, **E**, **RAF**); same locality, 640 m, Aug. 1961, *Keenan et al.* 905 (**A**, **E**, **K**, **RAF** pro parte); same locality, 305 m, Aug. 1961, *Keenan et al.* 933 (**A** pro parte, **E**, **K** pro parte, **RAF**)]. [5 or 6 records]

Distribution.—Northern India, Bhutan, Myanmar, Thailand and south-western China.

Ecology and phenology.—In Myanmar found on damp earth patches on rocky hillsides or in rocky places in forest. Herbarium labels indicate elevations ranging from 305 to 1,370 m. In neighbouring Thailand, the plants grow in deciduous dipterocarp-oak forest, evergreen hill forest and pine forest, and also occur at similar elevations as in Myanmar (Kurzweil, 2009, 2011 [both as *Habenaria humistrata*]). They grow in humous or sandy soils over granite or shale. In the eastern Himalayas, the plants of the synonymous *H. diphylla* var. *josephi* grow in subalpine grassland, in *Betula utilis* forest, among dwarf rhododendrons, and on grassy stream banks up to 4,880 m (Pearce & Cribb, 2002). The few specimens from Myanmar were flowering in July, August and November; in other parts of the distribution area flowering occurs mostly between June and September, rarely as late as October (Pearce & Cribb, 2002; Chen & Cribb, 2009; Kurzweil, 2009, 2011).

Notes.—This is the type species of Kränzlin's *Habenaria* sect. *Diphyllae* (Kränzlin 1892: 147).

46. *Habenaria* aff. *poilanei* Gagnep., Bull. Soc. Bot. France 78: 73. 1931; Seidenfaden, Opera Bot. 114: 68, fig. 37A. 1992; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 88. 2009; Averyanov, Turczaninowia 13(2): 56, fig. 38. 2010; Kurzweil in Fl. Thailand 12(1): 128, fig. 73. 2011; Tanaka *et al.*, Bull. Natl. Mus. Nat. Sci., Ser. B, 41(2): 81, fig. 4C. 2015. Types: Vietnam, Cana, Phanrang, among exposed rocks, 1,200 m, 24 Oct. 1925, *Poillane 12451* (syntype **P** [P00439683!]); same locality and habitat, 2 Nov. 1925, *Evrard 2421* (syntype **P** [P00439682!]).

Terrestrial herbs, slender, 15–25 cm tall, glabrous. *Leaves* 2, unequal, basal, partly adpressed to the ground, ovate or elliptic, $4\text{--}8 \times 2.5\text{--}5$ cm, sessile, subacute. *Inflorescences* lax, many-flowered,

rather wide; rachis 3–10 cm long; floral bracts ovate-lanceolate, 7–8 × ca 3.4 mm, acuminate. *Flowers* green or white and green, median sepal and spur green or greenish-white. *Pedicel and ovary* cylindric-fusiform, ca 12 mm long, patent. *Sepals* obtuse or subacute; median sepal forming a hood together with the petals, erect, concave, ovate, 3–4 × 2.5–3.3 mm; lateral sepals spreading, narrowly ovate, to 5 × 3 mm. *Petals* linear to lorate-spathulate, ca 4.2 × 0.8 mm, obtuse. *Lip* ca 5 mm long, deeply 3-lobed from the base, lobes linear; midlobe ca 6.5 mm long; side lobes 6–7 mm long, curved up, at right angle with the midlobe; spur cylindric, 7–11 mm long, distal part clavate. *Column* ca 1 mm tall; anther erect with narrow connective, anther canals about 1 mm long; stigma processes ca 1 mm long.

Myanmar.—Mandalay Region [Myingyan District, fide Tanaka *et al.* (2015: 81), photographic record]. [1 record]

Distribution.—? Central Myanmar (a single doubtful record), ? Thailand (a single doubtful record), Laos and Vietnam.

Ecology and phenology.—Habitat information is not available in Myanmar. In neighbouring Thailand, the plants were found in an open area over granite at an elevation of about 100 m (Kurzweil, 2009, 2011). The two syntypes from Vietnam were collected among exposed rocks. In Myanmar, the flowering time has not been recorded. In Thailand flowering in May; the two syntypes from Vietnam were collected in flower in October and November, respectively.

Notes.—This species is known from a few collections made in Vietnam and Laos. On the basis of morphological studies a plant collected in south-eastern Thailand “fits the concept of the Indochinese *Habenaria poilanei* Gagnep. rather well” and was consequently provisionally referred to this species (Kurzweil, 2009: 88). Also a photographic record of a plant from Mount Popa in central Myanmar was provisionally referred to *H. poilanei* based on its morphology (Tanaka *et al.* 2015: 81). However, the referral of these Thai and Myanmar plants to the Indochinese *H. poilanei* is in need of confirmation.

47. *Habenaria reniformis* (D. Don) Hook. f., Fl. Brit. India 6: 152. 1890; Seidenfaden, Dansk Bot. Ark. 31(3): 132, fig. 85. 1977; Seidenfaden, Opera Bot.

114: 67. 1992; Comber, Orch. Sumatra: 101. 2001; Chen & Cribb in Chen *et al.*, Fl. China 25: 149. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 82. 2009; Averyanov, Turczaninowia 13(2): 55, fig. 37. 2010; Chen *et al.*, Fl. China 25, Illustrations: fig. 193. 2010; Barretto *et al.*, Wild Orch. Hong Kong: 258, figs. 216–218. 2011; Kurzweil in Fl. Thailand 12(1): 133, fig. 76. 2011; Kurzweil & Saw Lwin, Gard. Bull. Singapore 67: 113. 2015.—*Listera reniformis* D. Don, Prodr. Fl. Nepal: 28. 1825.—*Neottia reniformis* (D. Don) Spreng., Syst. Veg. 3: 707. 1826.—*Herminium reniforme* Lindl. ex Wall., Numer. List no. 7067. 1832.—*Aopla reniformis* (D. Don) Lindl., Edwards’s Bot. Reg. 20: t. 1701. 1834. Type: Nepal, Wallich s.n., Numer. List no. 7067 (? holotype **K**, drawing seen!).

—*Habenaria clovisii* Gagnep., Bull. Soc. Bot. France 78: 68. 1931; Seidenfaden, Bot. Tidsskr. 68: 42, fig. 3. 1973. Type: Cambodia, Stung-streng, 1866–1868, Thorel 2143 (lectotype **P** [P00439699!], designated by Seidenfaden, 1977; isolectotype **P** [P00439700!]). Syntype: Vietnam, Prenh, near Dalat, 17 Oct. 1924, Evrard 1480 (**P** [P00439698!]).

—? *Habenaria anomaliflora* Kurzweil & Chantanaorr., Gard. Bull. Singapore 60: 207. 2009 (interpreted as a peloric form of *H. reniformis* by Kolanowska *et al.*, 2021: 79). Type: Thailand, Nakhon Nayok Province, Khao Yai National Park, Mo Sing To Reservoir, 25 Sept. 2005, Buakhlai 158 (holotype **PSU** [s]!; isotypes **BCU**!, **BKF**!).

Terrestrial or lithophytic herbs, slender, 5–20 cm tall, glabrous. *Tubers* globose, ca 1 cm in diameter. *Leaves* 1–4, basal, adpressed to the substrate, ovate to elliptic or cordate, 1.4–4 × 1–2.5 cm, obtuse or acute. *Inflorescences* lax, 2–7(–12)-flowered; rachis 3–8 cm long; floral bracts lanceolate, shorter than pedicel plus ovary, 6–10 × 1.5–3 mm, acuminate. *Flowers* 6.5–9 mm in diameter, green, yellowish-green, whitish or brown. *Pedicel and ovary* cylindric-fusiform, 8–18 mm long, patent. *Sepals* subacute or obtuse; median sepal forming a hood together with the petals, erect, concave, lanceolate-elliptic or ovate-elliptic, 3.5–5 × 1.5–3 mm; lateral sepals spreading or reflexed, ovate-lanceolate, 3.5–6 × 1.5–3.4 mm. *Petals* oblong, falcate, 3–4.5 × 0.8–1.6 mm, subacute or obtuse. *Lip* ca 3.8–10 mm long, very variable in shape, deeply 3-lobed with linear lobes or unlobed in peloric forms, spurred or

sometimes unspurred in peloric forms; midlobe 3.7–9 mm long; side lobes (if present) 6–29 mm long; spur (if present) cylindric, to 7.6 mm long, shorter than pedicel plus ovary, distally clavate. *Column* 1–2.3 mm long; anther canals short and insignificant; stigma processes clavate, 1.5–2 mm long. *Capsule* sessile, elliptic, 9.5–10 mm long, shortly beaked.

Myanmar.—Mandalay Region [Myingyan District, 26 Oct. 2009, *Saw Lwin et al. MPO 020 (SING)*]. Chin State [Mindat District, 1,200 m, 2 Sept. 2011, *Funakoshi et al. 085039 (MBK)*]. [2 records]

Distribution.—India, Himalayas, Myanmar, Thailand, Vietnam, Cambodia, southern China and Sumatra.

Ecology and phenology.—Habitat information in the two collections from Myanmar is not available; one of them was made at an elevation of 1,200 m. In other parts of the distribution area, the plants are found in grassy places in forest, in bamboo thickets, in scrubland and in cracks in limestone rocks, at an elevation ranging from 150 to 1,500 m (Chen & Cribb, 2009; Kurzweil, 2009, 2011; Averyanov, 2010). Bedrock in Thailand was indicated as sandstone or limestone. The two collections from Myanmar were flowering in September and October; in China and Thailand, flowering has been recorded between August and November.

48. *Habenaria humidicola* Rolfe, Bull. Misc. Inform. Kew 1896: 202. 1896; Seidenfaden, Opera Bot. 114: 68, fig. 36. 1992; Chen & Cribb in Chen *et al.*, Fl. China 25: 148. 2009; Kurzweil, Thai Forest Bull., Bot. (Special Issue): 83. 2009; Kurzweil in Fl. Thailand 12(1): 108, fig. 60, pl. VII-2. 2011. Type: China, Zhejiang, Ningpo Mts, in damp places in the shade of rocks, *Faber 200* (holotype ? **HK**).

Terrestrial or lithophytic herbs, slender, 15–22 cm tall, glabrous. *Underground tubers* cylindric, 1–4 × 0.5–1.5 cm. *Stems* terete, erect. *Leaves* 3–4, in a basal rosette, elongate-ovate or elliptic, 2.5–7 × 1–2.2 cm, acute or subacute. *Inflorescences* laxly few- to many-flowered; rachis 5–20 cm long; floral bracts ovate-lanceolate, shorter or longer than pedicel plus ovary, 5–14 × ca 3.3 mm, acuminate. *Flowers* ca 9 mm in diameter; green or pale green. *Pedicel and ovary* cylindric-fusiform, patent, 8–11

mm long. *Sepals* subacute or obtuse; median sepal erect, forming an open hood together with the petals, ovate-elliptic, concave, 3.2–4 × 2–3 mm, with three markedly thickened veins; lateral sepals spreading or reflexed, ovate-oblong, 3.5–4.5 × 1.5–2.2 mm. *Petals* linear, 3.2–4.2 × 0.7–1 mm, subacute or obtuse. *Lip* 5–9 mm long, deeply 3-lobed, all lobes linear or filiform; midlobe 3.2–6 mm long; side lobes 3.8–9 mm long; spur cylindric, 7–15 mm long, as long as or longer than pedicel plus ovary, sometimes slightly clavate. *Column* ca 1.8 mm long; anther erect or suberect with moderately wide connective, anther canals not prominent; stigma processes oblong-clavate, ca 1.5 mm long.

Myanmar.—Mandalay Region [Pyinoolwin District, 760 m, 27 Oct. 1927, *Clarke BG B (K)*]. [1 record]

Distribution.—Central Myanmar, northern Thailand and China.

Ecology and phenology.—In Myanmar reported in dense jungle close to water at an elevation of 760 m. In China and Thailand, the species has been recorded in forest, in damp places on shaded rocks and in humus in limestone areas at elevations of between 600 and 1,600 m (Chen & Cribb, 2009; Kurzweil, 2009, 2011). The single collection from Myanmar was flowering in October; in China and Thailand, the plants are flowering in August and September.

INSUFFICIENTLY KNOWN

The following two species are known to us only from the type specimens which are incomplete or largely eaten by insects, and from the protologues which are very brief and hard to interpret. In order to get a fuller understanding, we suggest that a re-collection is needed in order to permit a thorough examination.

49. *Habenaria longibracteata* (Lindl.) Hook.f., Fl. Brit. India 6: 166. 1890, **nom. illeg.**; Grant, Orchids Burma: 337. 1895.—*Platanthera longibracteata* Lindl., Gen. Sp. Orchid. Pl.: 293. 1835. Type: Myanmar, Ayeyarwady River banks, at Sundya, ? Sept. 1826, *Wallich s.n.*, Numer. List no. 7048 (holotype **K-W** [K001126647!]; isotype **K-LINDL!**; Lindley's sketch of the holotype in **K-LINDL!**). Fig. 10.



Figure 10. *Habenaria longibracteata* (Lindl.) Hook.f.: a–b. habit; c–f. immature flower bud: c. closed bud; d. column, lip and lateral sepal; e. front view of column and lip; f. side view of column. After Wallich *s.n.*, Numer. List no. 7048 (isotype **K-LINDL**), a–b. drawn by C. Sathish Kumar; c–f after a sketch attached to the isotype, reproduced with permission of the board of Trustees of the Royal Botanic Gardens, Kew.

Terrestrial herbs, robust, 60–91 cm tall. *Stems* terete, erect. *Leaves* 6, cauline and scattered along the stem, blades linear-oblong, $8\text{--}15.2 \times 1.7\text{--}2.5$ cm, acute, margins thickened. *Inflorescences*: shape unknown, many-flowered; floral bracts narrowly linear-lanceolate, much longer than the floral buds at the time the type specimen was collected, 50–76 mm long, long-acuminate. *Flowers* not developed at the time of collection, only several very small flower buds present. *Lip* of flower bud deeply 3-lobed; lobes linear, side lobes shorter than midlobe; spur short, obtuse. *Column*: stigma not known.

Myanmar.—Ayeyarwady Valley [district not traced, *Wallich s.n.*, *Numer. List no. 7048* (holotype **K-W**; isotype **K-LINDL**; sketch in **K-LINDL**)]. [1 record]

Distribution.—Endemic; so far only known from the type collection.

Ecology and phenology.—The habitat is not known. A hardly legible note on the type specimen appears to say ‘September’ which is probably the month the plant was collected.

Notes.—There are no mature flowers on the type specimen. The immature inflorescence comprises only small and immature flower buds. However, even in this very early stage it is evident that the lip is deeply 3-lobed, which supports the inclusion of this species in *Habenaria*.

50. *Habenaria yomensis* Gage, Rec. Bot. Surv. India 3: 105. 1904. Type: Myanmar, Magway Region, Minbu District, Sidoktaya Township, southern Chin Hills, Oct. 1902, *Shaik Mokim 434* (holotype **CAL** [acc. no. 463133!]). Fig. 11.

Herbs, apparently terrestrial, about 30 cm tall. *Stems* slender, erect. *Leaves* 3, radical, adpressed to the ground, broadly ovate, to 9.5×6.8 cm, membranous, subsessile, acute. *Inflorescences* lax, 10–12-flowered; rachis about 11 cm long; floral bracts narrowly lanceolate, much shorter than pedicel plus ovary. *Flower* colour not known. *Pedicel and ovary* about 18 mm long. *Sepals* acute; median sepal apparently forming a hood together with the petals, 6 mm long; lateral sepals reflexed, lanceolate, about 7×3 mm. *Petals* linear, longer than the lateral sepals. *Lip* deeply 3-lobed; midlobe linear, ca 12 mm long; side lobes falcate, broader

and about twice as long as the midlobe; spur slender cylindric, about twice as long as pedicel plus ovary, ca 35 mm long. *Column*: anther canals short.

Myanmar.—Magway Region [Minbu District, *Shaik Mokim 434* (holotype **CAL**!)]. [1 record]

Distribution.—Endemic; so far only known from the type specimen.

Ecology and phenology.—The habitat is not known; flowering in October.

DOUBTFULLY RECORDED

The following species have been recorded from Myanmar in the literature and in online lists. We have not seen any material.

Habenaria delavayi Finet [as *H. yunnanensis* Rolfe]: Kress *et al.* (2003: 81)

Habenaria lindleyana Steud. [as *H. latifolia* Lindl.]: Kress *et al.* (2003: 80)

Habenaria plantaginea Lindl.: POWO (2023)

Habenaria robustior (Wight) Hook.f.: POWO (2023)

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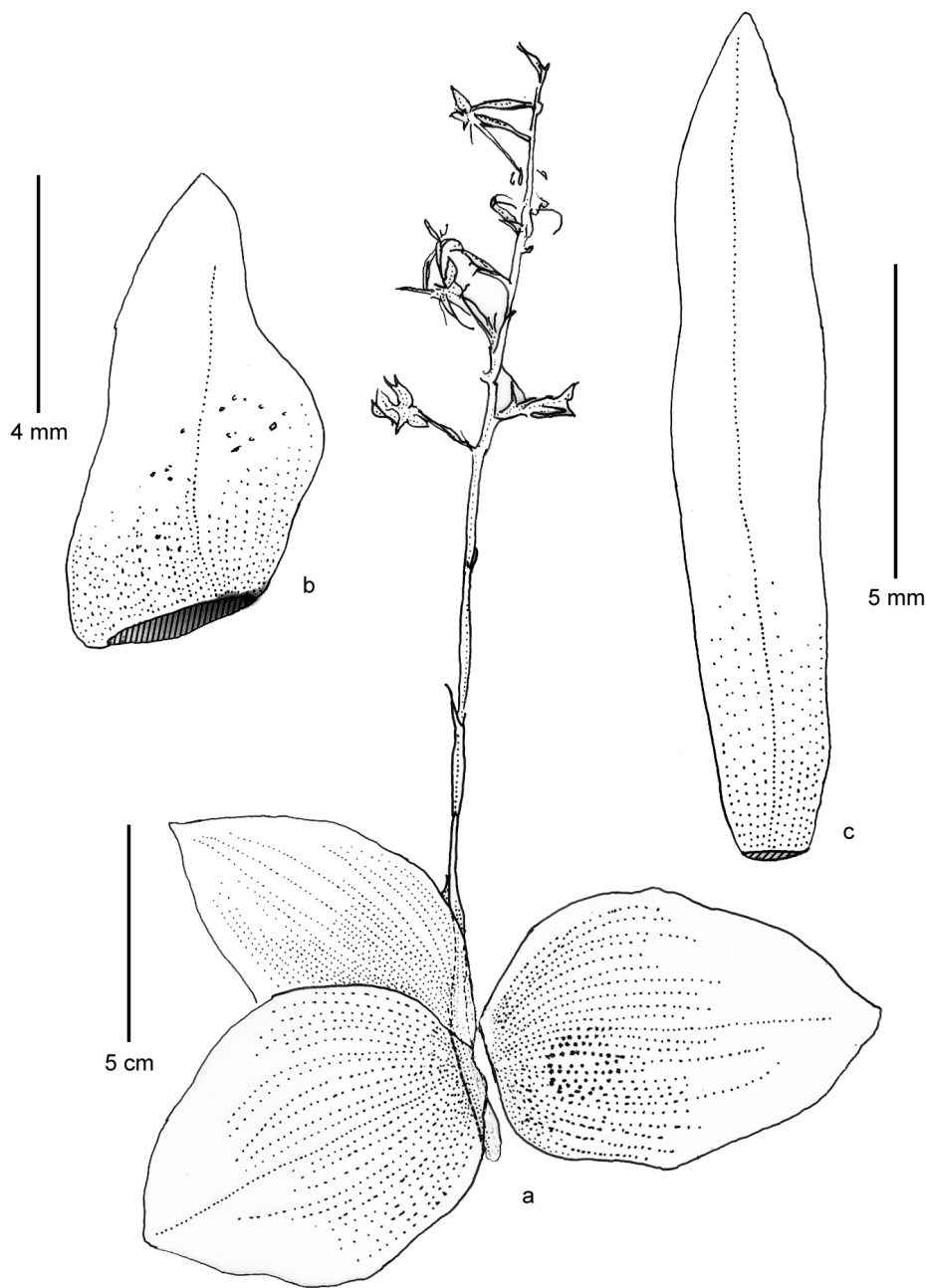


Figure 11. *Habenaria yomensis* Gage: a. habit; b. lateral sepal; c. petal. From *Shaik Mokim 434* (holotype CAL). All drawn by C. Sathish Kumar.

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