The genus *Habenaria* (Orchidaceae) in Thailand

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ABSTRACT. The taxonomy of the Thai species of the largely terrestrial orchid genus *Habenaria* Willd. is reviewed. Forty-six species are recognised. *H. humidicola* Rolfe, *H. poilanei* Gagnep. and *H. ciliolaris* Kraenzl. are newly recorded for Thailand based on a single collection each, although the identification of the latter two is uncertain. An aberrant specimen of *H. viridiflora* (Rottler ex Sw.) Lindl. is pointed out. *H. erichmichaelii* Christenson is reduced to synonymy under *H. rhodocheila* Hance. Several difficult and geographically widespread species complexes are identified and the need for future studies of all of the available material over the entire distribution range is emphasized. Based on the herbarium and spirit material examined here the following distribution pattern emerged: about 53% of all collections of Thai *Habenaria* species were made in northern Thailand (although this may partly be due to collector’s bias) and about 15% in north-eastern Thailand, while only between 4.5 and 7.5% come from each of the other floristic regions of the country. In addition, an assessment of the conservation status has been made in all species. The present study will form the basis for a later contribution to the Flora of Thailand.

KEY WORDS: *Habenaria*, Orchidaceae, Thailand, conservation, identification, morphology, systematics.

INTRODUCTION

*Habenaria* Willd. is a largely terrestrial orchid genus placed in subfamily Orchidoideae (Pridgeon et al., 2001). The genus currently accounts for about 600 species making it by far the largest in the subfamily. *Habenaria* is pantropical in distribution with approximately equal species numbers found in the continents of America, Africa and Asia (Senghas, 1973–1974). Due to the overall size of the genus and its wide distribution range a comprehensive taxonomic study was attempted only once, by Kraenzlin (1893) in which he recognized 347 species. Many taxonomic problems remain in the genus and further critical studies are needed, particularly in order to address questions regarding the relationships in many of the species complexes as well as the generic delimitation of *Habenaria* in general. In the last few years a number of genera were split off (such as *Platantheroides* Szlach., *Kraenzlinorchis* Szlach., *Smithanthe* Szlach. & Marg., *Medusorchis* Szlach.) but are not based on detailed research results, which would also need to include molecular data in our present age. These genera are not followed here as the arguments supporting their separation from *Habenaria* are not very convincing.

In Thailand *Habenaria* is well represented with 46 species. The largest number of species is found in the northern and north-eastern parts of the country. Thai *Habenaria* species are normally terrestrial and are found in various forest types, ranging from dry to

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moist deciduous or evergreen forest, bamboo forest, pine forest and open tree savanna, thriving from low altitudes to over 2000 m. In forests the *Habenaria* species are often found in open areas with grass or broad-leaved herbageous cover. A few species are also found in grassland or bog, for example *H. rumphii* (Brongn.) Lindl. In addition, *H. vidua* E.C.Parish & Rehb.f. grows consistently on more or less exposed limestone cliffs and *H. carnea* Weathers is usually found on limestone rocks in evergreen forest. Several other largely terrestrial *Habenaria* species are occasionally also found in rock crevices. Very rarely Thai *Habenaria* species have been found growing as epiphytes (see cf. *H. ciliolaris* Kraenzl., also *H. rhodocheila* Hance was once collected in moss on a tree). While many of the Thai *Habenaria* species are very widespread in Asia, others are rather restricted in their distribution and outside of Thailand are only found in neighbouring countries like Myanmar, Cambodia and Laos. In addition, five species are currently considered endemic to Thailand, namely *H. hastata* Seidenf., *H. humistrata* Rolfe ex Downie, *H. hosseusii* Schltr., *H. longitheca* Seidenf. and *H. porphyricola* Schltr.

At the end of the previous century and at the beginning of the present major contributions to our knowledge of the Thai orchids were made by the Danish Ambassador to Thailand Dr Gunnar Seidenfaden. His studies managed to transform the orchid flora of Thailand from one of the most poorly known on the Asian continent to one of its best known (Seidenfaden, several papers). Seidenfaden’s treatments are a complete inventory of the Thai orchid flora, and are based on the examinations of numerous herbarium specimens from within and outside Thailand as well as on an exhaustive literature study. The keys and accurate line drawings in his publications are an invaluable identification aid. Equally valuable are Seidenfaden’s studies of related species and his discussions of relationships. Seidenfaden also elaborated on the frequently complicated taxonomic history of the species.

The present review is based on morphological examinations of most of the available herbarium and spirit material and will form the basis for a later treatment of the genus *Habenaria* in the Flora of Thailand. To a large extent the taxonomic concept of Seidenfaden (1977) has been followed. The amount of the material that is now available for study has increased substantially since Seidenfaden’s work, thus creating a more complete foundation for floristic work. Unlike previous treatments the present study also contains detailed morphological descriptions of all of the species occurring in Thailand. Nevertheless, several taxonomic problems remain. In several species complexes monographic treatments over the entire distribution range would be needed in order to clarify the taxonomy of the group, which is obviously beyond the scope of the present study. Future work on these species complexes is needed and must also include molecular, cytological and ultrastructural evidence. Three species are here newly reported for Thailand, namely *H. humidicola* Rolfe and *H. ciliolaris* Kraenzl. from northern Thailand and *H. poilanei* Gagnep. from the south-east of the country, although the identification is uncertain in the latter two species. A specimen from Doi Chiang Dao (northern Thailand) also does not clearly match any of the currently recognised species but is here interpreted as an aberrant specimen of *H. viridiflora*.
MORPHOLOGY

Like many species of subfamily Orchidoideae the species of the genus Habenaria are deciduous herbs and have underground root tubers. The Thai representatives are most commonly glabrous except for the floral bracts and the bract-like leaves on the upper part of the stem which may be elongate-papillose or short-hairy on the margins, and occasionally also the tepal margins are short-hairy. Strongly hairy stems with very elongate papillae and stout grouped or branched hairs are found in H. longiteca, H. reflexa Blume, H. austrosinensis Tang & F.T.Wang, and hairy stems with a mixture of short glandular hairs and elongate papillae are found in H. vidua. The stems are generally unbranched and most commonly 30–60 cm tall, although they may be as short as 10 cm (in H. reniformis (D.Don) Hook.f., H. porphyricola, H. siamensis Schltr., H. humistrata and H. anomaliflora Kurzweil & Chantanaorrapint) or can measure over a metre (e.g. in H. commelinifolia (Roxb.) Wall. ex Lindl.). The leaves are glabrous and are either basal or cauline, and in the latter case mostly clustered or scattered in the lower stem half. They are generally sheathing at the base and are sessile or shortly petiolate. Leaves in the middle portion of the stem are normally the largest while the leaf size decreases towards the lower and upper stem part. In several species the leaves are basal and adpressed to the substrate (H. reniformis, H. porphyricola, H. siamensis, H. humistrata, H. anomaliflora, H. lindleyana Steud.). The leaves of Thai habenarias are very diverse in their shape, ranging from linear and grass-like to broadly oval, lanceolate and elliptic. Their apex may be acute, subacute or obtuse and is often pronouncedly mucronate. Leaves often have a semi-translucent border which is also found in Habenaria species in nearby regions (e.g. Pearce & Cribb, 2002), although this character is rarely mentioned in the literature. Margins of the leaves are frequently variously papillose. Below the leaves there are generally one to few tubular white or pale-coloured cataphylls, and the uppermost of these may have a short lamina. Most Thai Habenaria species have one to few bract-like leaves above the foliages leaves forming a gradual transition to the floral bracts.

The inflorescences are terminal and always unbranched. They range from lax to fairly dense and compact in a head, and bear few to many small, medium-sized or large and generally resupinate flowers. Green, white or yellow colours dominate in the Thai habenarias, except in H. rhodocheila and H. carnea where the flowers can be white, pink, red, orange or yellow. The ovary is usually indistinguishable from the pedicel and is smooth or papillose. An exception is H. corymbosa E.C.Parish & Rchb.f. where the distinction between the ovary and the pedicel is very pronounced. The sepals are free (though sometimes fused at their very base), unlobed, concave and normally glabrous but sometimes have papillae or short hairs on the margins. The median (= dorsal) sepal is erect (except in H. corymbosa where it is reflexed), and the patent, spreading or reflexed lateral sepals are mostly similar in shape but are often variously oblique. A remarkable shape of the lateral sepals is found in H. commelinifolia, H. longiteca, H. reflexa and H. austrosinensis where they are so strongly oblique that their front margins form a false apex and point down while the true apex is close behind the base of the median sepal. The glabrous petals are unlobed or less commonly bifid; the two lobes can be more or less equal in size or the anterior lobe can be minute. Most commonly the petals (or in the case of bifid petals their posterior lobes) are erect and are more or less cohering with
the median sepal. Most Thai Habenaria species have deeply 3-lobed lips with linear or linear-lanceolate lobes. In some species the side-lobes are wider but lacinate-timbriate (H. limprichtii Schltr., H. godfroyi Rchb.f., H. medioflexa Turrill, H. myriotricha Gagnep., H. trichosantha Lindl.). The lips are either 3-lobed from the base or have an unlobed basal part which can be several millimetres long. Unlobed lips are rather uncommon, and are only found in H. hosseusii, H. mandersii Collett & Hemsl. and H. dentirostrata Tang & F.T.Wang and in the two possibly abnormal species H. malintana (Blanco) Merr. and H. anomaliflora. The lip of Thai Habenaria species usually has a spur of various lengths which can be cylindrical or clavate, and is either pendent, forward-curved or reflexed in its orientation. Spurless flowers (always associated with unlobed lips) are only found in H. malintana and H. anomaliflora. Also the gynostemium (= column) of Habenaria, with its lack of a prominent undifferentiated column-part, the 3-lobed rostellum and the sectile pollinia conforms with the situation in other members of the subtribe Orchidinae (Pridgeon et al., 2001). In Thai species the anther is mostly more or less erect or somewhat reflexed and has its thecae adjacent and only rarely separated by a wide connective (e.g. H. limprichtii). Usually the thecae are differentiated into thick loculi (the pollen-bearing part) and short or long narrow basal extensions referred to as the anther canals. The auricles on the side of the anther are either inconspicuous or prominent. Stigmas are freely projecting short or elongate processes. The lateral rostellum arms are as long as the anther canals, and the central lobe is usually insignificant or up to half as long as the anther. Exceptions are H. rhodocheila and H. carnea where the central rostellum lobe is very large and overtops the anther.

CONSERVATION

In the absence of a comprehensive study of the national conservation status of the Thai habenarias the number of localities from which collections are available is here taken as an indication of a species’ abundance. This is only a very approximate measure as it is also influenced by collector bias (in that certain collecting localities are favoured over others; Parnell et al., 2003), but appears the best solution at the moment. The usefulness of this approach is also limited by the fact that some of the herbarium collections are rather old and the populations may have disappeared as a result of habitat destruction. The number of available herbarium collections is generally rather low, and the known distribution ranges are therefore almost always fragmented.

Two books on threatened plants in Thailand were published recently (Suddee, 2005; Santisuk et al., 2006). Although they both include only few Habenaria species they are nevertheless a useful basis. Assessments of three species according to IUCN criteria were made in one of them (Santisuk et al., 2006).

The number of available natural habitats has obviously decreased in Thailand due to the continued development of the country which has resulted in a general decline of populations (Santisuk et al., 1991), and many of the orchids have only survived in national parks and other nature conservation areas. However, several factors may give a wrong impression of a species’ rarity: Individuals of the genus Habenaria are comparatively short-lived (compared with many woody plants) and are therefore very sporadic in their
appearance as colonies may disappear quickly. Many Habenaria species are not very showy with their frequently greenish flowers and are therefore probably often overlooked. Like for other deciduous plants, habenarias are only visible and recognisable during their flowering time which is usually only one or two months of the year.

The commonest species is the widespread Habenaria dentata (Sw.) Schltr. for which 150 collections were examined and which was also frequently seen during personal fieldtrips in various parts of the country. Other common and fairly widespread species are H. chlorina E.C.Parish & Rehb.f. (31 collections examined), H. lindleyana (78), H. lucida Wall. ex Lindl. (45), H. malintana (45), H. rhodocheta (93), H. rostellifera Rehb. f. (51) and H. rumphii (34). Also regularly seen are H. furcifera Lindl. (26), H. hosseusii (25), H. humistrata (28), H. limprichtii (28) and H. rostrata Wall. ex Lindl. (21). Several other species are only known from one or very few collections. Examples in this category are H. godefroyi, H. hastata, H. porphyricola, H. reniformis and H. siamensis.

**BRIEF PHYLOGENETIC CONSIDERATIONS**

As there is currently no sound phylogeny of the genus Habenaria based on all of the available evidence it is obviously not possible to construct a phylogeny of the species found in Thailand, but several groups of morphologically similar and probably closely related species can be recognised.

1) The Habenaria amplexicaulis group comprises H. amplexicaulis Rolfe ex Downie and H. thailandica Seidenf. The group is characterised by having several large cauline leaves, flowers with bipartite petals with two elongate lobes and a lip with three nearly equally long linear lobes. The differences between the two species relate to the floral size but are rather minor.

2) The Habenaria medioflexa group (H. medioflexa, H. myriotricha and H. trichosantha) is characterised by flowers with entire petals and lacinate or deeply fimbriate lip side-lobes. Within the group H. medioflexa is distinct with its gynostemium with slender and rather high auricles while the distinction of the remaining two species is based on minor flower size differences.

3) The Habenaria longitheca group (H. longitheca, H. reflexa, H. austrosinensis) has strongly hairy stems and oblique lateral sepals with a false downward pointing apex. Elongate anther canals are found in all species. The Malaysian H. kingii Hook.f. is also very similar. H. commelinifolia is also similar in the shape of its lateral sepals and the structure of its elongate anther canals but differs by having glabrous stems.

4) The Habenaria dentata group (H. dentata and H. malintana) is characterised by having few, narrow, cauline leaves and fairly large white flowers with usually marginally denticulate sepals and petals. The two species are rather common and frequently co-occur in the same population. They differ in their lip structure, with H. dentata having 3-lobed spurred lips while lips of H. malintana are unlobed and unspurred, and it is possible that the latter species is merely an abnormal form of the former. However, molecular and other evidence to support this assumption is needed.

5) The Habenaria rostellifera group (H. rostellifera, H. rostrata and H. erostrata
Tang & F.T.Wang) has a lip with three equal and spreading linear lobes and a transversal structure in front of the spur entrance. This structure is rather small but prominent in *H. rostrata* and *H. erostrata* but is a ligule measuring several millimetres in *H. rostellifera*. The ovaries are long and beaked in the group.

6) Fairly dense inflorescences, lips with three equal and narrowly oblong lobes, basally extensively fused petals and lips, and short anther canals characterise the *Habenaria marginata* group (*H. marginata* Colebr. and *H. avana* Hook.f.). There appear to be slight differences in the leaf arrangements, but in view of the few collections that are available for study and the variation found in these this difference is probably not very critical. Floral differences are minor and rely mainly on the flower colour.

7) The *Habenaria hosseusii* group (*H. hosseusii*, *H. mandersii* and *H. dentirostrata*) is characterised by having an unlobed and long-spurred lip with involute margins. A prominent erect tongue in front of the spur entrance is found in the group, the exact shape of which is critical in the delimitation of its three species.

8) The seven species of the *Habenaria humistrata* group (*H. humistrata*, *H. siamensis*, *H. porphyricola*, *H. reniformis*, *H. humidicola*, *H. poilanei* and *H. anomaliflora*) are small plants with two to four basal leaves which are adpressed to the ground or spreading just above it. The lip is mostly 3-lobed and has side-lobes which are longer than the midlobe. The exception is *H. anomaliflora* which is probably a constant abnormality with a subactinomorphic perianth.

9) In the *Habenaria rhodocheila* group (*H. rhodocheila* and *H. carnea*) the leaves are basal or scattered in the lower stem portion. In contrast to the other Thai *Habenaria* species the flowers are red, pink, orange, yellow or rarely white, and the lip has four ovate-oblong lobes. An interesting character of this group is the central rostellum lobe which is as high as or higher than the anther.

**MATERIAL AND METHODS**

Specimens from the herbaria AAU, B, BCU, BK, BKF, BM, C, CMU, K, L, P, PSU, QBG as well as the Herbarium of Faculty of Science, Chiang Mai University and the herbarium of the Suan Luang Public Park in Bangkok (Thailand) were examined. Herbarium abbreviations follow the Index Herbariorum (http://sweetgum.nybg.org/ih/) except in the latter two herbaria for which abbreviations are not available (in the following text abbreviated as ScCMU and Suan Luang, respectively). The symbol [s] after the herbarium abbreviation indicates a spirit specimen. A question mark in front of the locality indicates that the identification is questionable, which in most cases is due to incomplete material. All cited specimens have been examined by the author. Some of the herbarium material was collected during the period of the Thai-Danish, Thai-Dutch and Thai-Japanese expeditions (mostly in the middle of the previous century) and unfortunately some of this is now in a rather poor state. Only complete specimens where the identity could be confirmed are included in the present study. In most cases inadequate collector’s notes are available on aspects like the bedrock, soil and habitat; this is a common problem in taxonomic botany.
THE GENUS HABENARIA (ORCHIDACEAE) IN THAILAND (H. KURZWEIL)

KEY TO THE HABENARIA SPECIES IN THAILAND

1. Petals bilobed, anterior and posterior lobe entire or laciniate; occasionally anterior lobe strongly reduced to a lobe under 3 mm long 2
2. Petal lobes laciniate

1. H. holotricha
2. Petal lobes simple; anterior lobe sometimes minute

3. Sepal apices long-caudate to long-acuminate or with prominent mucros 4
4. Sepals long-caudate to long-acuminate

5. Both petal lobes filiform, in the examined Thai material 15–20 mm long 2
6. Posterior petal lobe oblong, 7–11 mm long; anterior lobe strongly reduced, 1.5–3 mm long

2. H. pantlingiana
3. H. stenopetala
4. H. falcatopetala

1. H. amplexicaulis
7. Lip midlobe 4–7 mm long. Posterior petal lobe with one strong vein and one weaker and shorter vein 7

8. Lip side-lobes deeply laciniate

9. Flowers large. Median sepal 19–28 mm long. Spur 16–21 mm long 8
10. Flowers smaller. Sepals 16 mm long or shorter. Spur various
11. Auricles slender, subulate, as high as or higher than the anther 11
12. Median sepal 8–8.5 mm long, lateral sepals 7.5–11.5 long 11
13. Lateral sepals recurved and very oblique with a broadly rounded anterior margin and nearly straight posterior margin, often inrolled. Lip without a transversal ridge in front of the spur entrance
14. Each lateral sepal much longer than the median one; strongly oblique so that the front margin points down and forms a false apex while the true apex is close to the base of the median sepal
15. Spur 60–80 mm long. Lip over 30 mm long 8
16. Anther canals 10–12 mm long. Spur 6–7 mm long, thick-clavate and apically globular, hidden between the recurved lateral sepals
17. Spur strongly curved forwards. Petals broadly triangular
18. H. longitheca
19. Spur to 25 mm, longer than the ovary 13
20. Lip tripartite

21. H. lindleyana
22. Leaves 3–5–(6), subradical, broadly ovate. Lip side-lobes subulate
23. Lip midlobe fleshy, upcurved and adnate to the median sepal/petals hood; side-lobes fleshy and recurved. Spur to 25 mm, longer than the ovary

21. H. lucida
23. Lip not like this
24. Anther canals elongate, (1–)2–5 mm long and clearly differentiated from the much thicker anther loculi, straight, curved upwards or geniculately upwards bent
25. Lip side-lobes subulate, shorter than the midlobe
26. Lip with a raised ridge in front of the spur entrance, taking the shape of a low collar. Lateral sepals recurved, prominently oblique
22. H. acuifera
26. Lip without a raised ridge in front of the spur entrance. Lateral sepals spreading and not very oblique
23. H. chlorina
25. Lip lobes all nearly equally long or side-lobes longer than midlobe
27. Ridge at the base of the lip developed as an erect 3–4 mm high obscurely 3-lobed ligule that protrudes above the anther canals. Anther canals rather long, geniculately bent upwards at their middle
24. H. rostellifera
27. Base of lip only with a rather low collar. Anther canals straight or only slightly curved upwards
28. Spur shorter than the ovary. Auricles prominent and rather narrow, nearly as high as the anther
25. H. rostrata
28. Spur longer than the ovary. Auricles small bulges on the side of the anther
29. Inflorescence dense or subdense. Stem glabrous. Leaves scattered in the lower stem portion. Petals oblong, to 4.5 by 2 mm. Spur slightly clavate
26. H. erosstrata
29. Inflorescence lax. Stems short-hairy or elongate-papillate. Leaves clustered well above the ground. Petals broadly ovate, 6–8 by 4–6 mm. Lip side-lobes pointing upwards, lip midlobe recurved below the flower; spur cylindric. Plants normally growing in crevasses in limestone rocks
27. H. vidua
24. Anther canals shorter than 0.8 mm and usually not clearly distinct from the anther loculi, most commonly only 0.2–0.5 mm long
30. Inflorescence lax. Relative spur length various. Lip side-lobes often (but not always!) longer than the midlobe
31. Leaves large, (1.9–)2.5–4(–5.7) cm wide, cauline and in a cluster well above the ground
28. H. furcipera
31. Leaves narrower, not more than 1.1 cm broad, erect or spreading, clustered close to the ground
32. Lip side-lobes thread-like and much longer than the midlobe. Leaves grass-like, not more than 0.4 cm wide
29. H. khasiana
32. Lip side-lobes not thread-like and not much exceeding the midlobe in length. Leaves not grass-like, 0.5–1(–1.1) cm wide
33. Lip side-lobes narrowly oblong, slightly longer than the midlobe. Spur to 21 mm long. Petals broadly or narrowly triangular, subacute or obtuse. Anther canals to 0.5(–0.8) mm long
30. H. viridiflora
33. Lip side-lobes subulate, much shorter than the midlobe. Spur 4–5 mm long. Petals obliquely triangular, acute, with a minute lobe on the distal side. Anther canals ca 0.3 mm long
31. H. hastata
30. Inflorescence dense or semi-dense. Spur shorter than the ovary. Lip side-lobes as long as or shorter than the midlobe
34. Lip midlobe much longer than the side-lobes. Lateral sepals strongly reflexed. Leaves linear or narrowly lanceolate-oblong
32. H. rumphii
34. Lip lobes normally similar in length. Lateral sepals spreading and forwards pointing. Leaves lanceolate-oblong
35. Flowers orange or yellow. Leaves mostly scattered in the middle or basal part of the stem
33. H. marginata
35. Flowers white. Leaves scattered along the stem
36. Lip simple
36. Spur obsolete or subobsolete
37. Median sepal 9.7–17 mm long
19. H. malintana
37. Median sepal 5.6–7 mm long
44. H. anomaliflora
36. Spur present, 28–100 mm long. Lip oblong-spathulate with a raised tongue in front of the spur entrance
38. Spur (28–)30–38(–47) mm long. Laminate flange in the middle of the raised tongue stretching
over most of its length; lateral parts of the tongue without teeth

38. Spur (48–)60–100 mm long. Laminate flange in the middle of the raised tongue small or minute; lateral parts of the tongue with prominent teeth

39. Spur to 70 mm long. Raised tongue in front of the spur entrance bilobulat at apex

36. H. dentirostra

39. Spur (48–)60–100 mm long. Raised tongue in front of the spur entrance obtuse or mucronate at apex

37. H. hosseusii

19. Small plants, with (1–)2–3(–4) radical leaves flat on the ground or spreading just above the soil surface

40. Sepals and petals 3.5–4.5 mm long. Spur 5–8 mm long

41. Leaves ovate to elliptic 1.4–4 cm long. Spur 3–7.6 mm long but often much shorter

38. H. reniformis

39. H. humidicola

41. Leaves elongate-ovate to elliptic, 4–7 cm long. Spur 7–8 mm long

42. Spur longer than the ovary, 15–25 mm long. Stigma processes much longer than the anther canals (about 3–5 times as long)

43. Ovaries erect, close to the rachis and inflorescence therefore rather slender. Lip side-lobes forming a right angle with the midlobe. Lateral rostellum lobes not widening towards the apex

41. H. humistrata

43. Ovaries patent and inflorescence therefore rather wide. Lip side-lobes and lateral rostellum lobes various

44. Lip side-lobes forming an acute angle with the midlobe. The short lateral rostellum lobes bending upwards and widening towards their truncate apex

42. H. siamensis

44. Lip side-lobes forming a right angle with the midlobe. Lateral rostellum lobes not widening towards their apex

43. cf. H. potianei

18. Central rostellum lobe prominent and as high as or higher than the anther. Flowers orange, red, pink or rarely white

45. Petals broadly ovate, several-veined. Auricles slender triangular, raising above the anther canals

45. H. carnea

46. H. rhodocheila


Terrestrial, deciduous. Stems to 100 cm tall. Leaves 6–10, spreading, cauline and scattered in the middle part of the stem, lanceolate-elliptic, acute or acuminate, mucronate, 13–21 by 3.5–5.1 cm. Bract-like leaves 6, lower spreading and upper largely erect, lanceolate, acuminate, 3.3–10 cm long, not or only shortly sheathing. Inflorescences semi-dense, many-flowered; rachis 31 cm long; floral bracts lanceolate, acuminate, 25–48 by 4–6 mm. Flowers 26–38 mm across; variegated dark red, orange and white; sepals and petals also reported as pale brown and lip white. Ovary (including pedicel) 18–22 mm long. Sepals long-acuminate, 5-veined; median sepal erect, elliptic-ovate, 15–19 by 5–8 mm; lateral sepals spreading, slightly obliquely elliptic-ovate, 17–19 by 5–7.5 mm. Petals suberect, bilobed, both lobes split into several acute linear laciniae 18–25 mm long. Lip 21–28 mm long, split into acute linear laciniae 18–23 mm long, with a basal united 5–6.5 by 2–2.6 mm large part; spur cylindric, 17–20 mm long, thickened in the upper part. Gynostemium 4–6 mm long, anther canals ca 2 mm long, stigmas ca 3 mm long.
Thailand.— NORTHERN: Chiang Mai [Mae Rim, Nanakorn et al. 12630 (QBG [s]); Doi Inthanon, Garrett 4/8 (C [s], K)]; NORTH-EASTERN: Loei [Na Haew, Pumicong & Maknoi 488 (QBG, QBG [s])]; without exact locality, BCU s.n. (BCU [s] 008922) [4 collections seen].

Distribution.— Laos.

Ecology.— In moist upper deciduous forest, also found in limestone crevices; 900–2000 m altitude. Flowering: Aug.–Oct.

Conservation.— Material from only three widely scattered specified localities and one unknown locality was available. The species was listed in a book on threatened plants of Thailand (Suddee, 2005: 130). IUCN red list category ‘Endangered’ based on geographic range and decline (B2a,b(iii); IUCN, 2001).


Notes.— In tropical SE Asia there are several Habenaria species with the lip side-lobes deeply split into a large number of filiform lobes, and two subgroups can be distinguished. The first comprises those species that have bilobed petals which are often further split into laciniae (including H. holotricha, H. ternatea Rchb.f., H. andamanica Hook.f., H. polytricha Rolfe), while the other group has entire petals (among others H. medioflexa, H. myriotricha, H. trichosantha, H. medusa Kraenzl., H. beccarii Schltr.). Diagnostic characters within the group are the number of the lobes of the petals and the lip, the sepal size and the spur length. The taxonomy of the group was discussed by Seidenfaden (1973) who pointed out that the differences between the species are very small and that a thorough study of the entire group is needed in order to clarify the relationships and to determine whether all species are sufficiently distinct to be recognised. The only Thai species with laciniate-split lip lobes and two-lobed petals is H. holotricha. The plant had originally been identified as H. andamanica which is indeed very close, and in future may prove to be conspecific.


Terrestrial, deciduous, glabrous. Stems to 50 cm tall. Cataphylls to 7, lanceolate or linear-lanceolate, tubular, to 4.5 cm long, scattered on the stem below the leaves, uppermost leaves with a blade to ca 1 by 0.8 cm. Leaves 5–7, spreading, in a cluster above the middle of the stem, ovate-elliptic, acute or acuminate, mucronate, (7.5–)9–14 by 2.5–4.8 cm, margin often somewhat undulate. Bract-like leaves 2, erect, tubular, foliaceous,
ovate, acuminate, 2.5–5 cm long, sheathing or not, margins entire. Inflorescences dense or semi-dense, ca 20-30-flowered; rachis 4–9 cm long; floral bracts ovate-lanceolate, acuminate to caudate, (19–)21–25 by 3.4–6 mm, shorter than or as long as the ovary plus the pedicel, often papillose, margins entire. Flowers 13–16 mm long; green or pale green, lip and petals sometimes whitish, pollinia orange-yellow; the sepals and petals with filiform caudae which take up about one third to half of their length; flowers scented. Ovary 11–25 mm long, mostly differentiated from the pedicel which is to 5 mm long. Sepals ovate or ovate-lanceolate, long-caudate, 1- or 3-veined; median sepal erect, 22–30 by 3–4 mm; lateral sepals spreading, 18–29 by 3.5–4 mm. Petals bilobed into an erect posterior lobe and a spreading anterior lobe, the lobes filiform, in the examined Thai material 15–20 mm long. Lip 18–28 mm long, deeply 3-lobed from the base, all lobes filiform; midlobe 18–28 by 0.3–0.4 mm; side-lobes 14–28 by 0.3–0.4 mm; spur cylindric, 19–20.5 mm long, clavate. Gynostemium 1.8–2 mm long, anther 4.5 mm long, reflexed, anther canals ca 2 mm long, straight.

Thailand.— NORTHERN: Chiang Mai [Doi Chiang Dao, Pumicon & Watthana 348 (QBG [s]); idem., Indhamusika 31 (QBG [s]); without exact locality, Sukxsathan 1034 (BCU [s]); idem., Baramee s.n. (BCU [s] 009896)] [4 collections seen].

Distribution.— NE India and Nepal to S China and S Japan.

Ecology.— Found in broad-leaved forest and open grassland; 1500–2000 m altitude. Flowering: July–Aug.

Conservation.— The species is known from only four collections made in Chiang Mai Province in northern Thailand, two of which are from unspecified localities. The two known localities are situated in a wildlife sanctuary which gives the plants a certain amount of protection. IUCN red list category ‘Endangered’ based on geographic range and decline (B2a,b(iii); IUCN, 2001).


Notes.— This species is very distinct with the long-caudate apices of the sepals and petal lobes, which give the flowers a somewhat spider-like appearance.


Terrestrial, deciduous, glabrous. Stems 49–63(–80) cm tall. Cataphylls 6, tubular, sheathing, enveloping the stem largely or completely to 27(–38) cm high; uppermost sometimes with a blade to 3 by 0.8 cm. Leaves 6–10, spreading, in a cluster near the middle of the stem, oblanceolate-elliptic, acuminate, (8–)10–20 by 2.5–5.3 cm, with an obscure pale semi-translucent border. Bract-like leaves 1–5, erect, lanceolate, acuminate, 2.5–3.5 cm long, sheathing or not, with a prominent or obscure pale and semi-translucent...
Figure 1. *Habenaria steno*petala Lindl.: a. plant; b. flower; c. gynostemium. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
border, margins entire. Inflorescences densely or subdensely many-flowered; rachis 4–11 cm long; floral bracts lanceolate, acuminate, 16–22 by 5–7 mm, slightly longer to slightly shorter than the pedicel plus the ovary, margins entire. Flowers 10–20 mm across; green or pale green, also recorded as white, anther yellow. Ovary (including pedicel) 12.5–17 mm long. Sepals elongate-elliptic, long-acuminate, 3-veined; median sepal erect, 9.5–13 by 5–7 mm; lateral sepals spreading, 8–13.8 by 5–5.8 mm. Petals bilobed into a posterior lobe nearly as long as the median sepal and a small anterior lobe; posterior lobe erect but not forming a hood with the median sepal, falcately oblong, acute, 1-veined, 7–11 by 1.2–1.8 mm; anterior lobe parallel to the lip base, 1.5–3 by 0.5–0.7 mm long. Lip 10–17 mm long, deeply 3-lobed above a basal stalk of 2–4 by ca 3.5 mm, all lobes narrowly attenuate; midlobe 8–13 by 1.5–2 mm; side-lobes 8–11 by 1.1–1.3 mm; spur cylindric, 13–17(–23) mm long, slightly geniculate, thickened towards the apex. Gynostemium 4–5 mm long, anther canals ca 2 mm long, straight, stigmas stout, ca 3 mm long.

Thailand.— NORTHERN: Mae Hong Son [Pang Mapha, Suksathan 3599 (QBG)]; Chiang Mai [Doi Suthep, illegible s.n. (K H2007/02483-101); idem., Kerr 277 (holotype of Habenaria sutepensis K)]; idem., Kerr s.n. (C [s] vial 378); idem., Seidenfaden & Smitinand 3014 (C [s]); Doi Pui, Maxwell 88-977 (BKF, CMU); idem., Tagawa et al. 9492 (C [s]); Doi Inthanon, Watthana 2410 (QBG, QBG [s]); idem., Larsen & Larsen 34390 (AAU, K); idem., Phengklai et al. 7211 (BKF); Chom Tong District, Maxwell 92-487 (ScCMU, ScCMU [s, L, P]); ? Mae Dang, Maxwell 90-23 (CMU)]; Chiang Rai [Khunkorn Waterfall Forest Park, Boonkerd et al. KK 1042 (BCU [s]); Phitsanulok [Phu Soi Dao, RK 605/50 (QBG [s])]; NORTH-EASTERN: Loei [Phu Kradueng National Park, Triboun 905 (l) (BK [s]); Phu Luang National Park, Wichien s.n. (BKF SN149166)]; EASTERN: Ubon Ratchatani [Phu Chong Na Yoi National Park, Suddee 2611 (BKF [s]) [17 collections seen, 1 of them uncertain].

Distribution.— India and Nepal to S China, S Japan and the Philippines.

Ecology.— Found in primary evergreen forest; 500–1700 m altitude. Recorded over granite and limestone. Flowering: July–Sept.(–Oct.).

Conservation.— Fourteen collections from northern Thailand plus two from the north-east and one from the east have been seen. As all except two of the localities are situated in national parks or forest parks the protection of this species can be considered as adequate at the moment. IUCN red list category ‘Least Concern’ (IUCN, 2001).

Illustrations.— Seidenf. & Smitinand, Orchids Thailand: fig. 24. 1959 [as Habenaria sutepensis]; Seidenf., Dansk Bot. Ark. 31(3): fig. 37a–c. 1977; present paper: fig. 1a–c.

Notes.— Within the group of species with bilobed petals, Habenaria stenopetala is easily distinguished by the sepals with their long-aristate apices, the dense inflorescence and the 3-lobed lip. A variety Habenaria stenopetala var. polytricha Hook.f., which has been recognised in the past (e.g. Seidenfaden, 1977) is now referred to H. pantlingiana (Seidenfaden, 1995: 12; see above).

Terrestrial, deciduous. Stems 50–71 (–90) cm tall. Cataphylls 4, tubular, sheathing, acute, enveloping the stem to 28 cm high. Leaves 5–6, spreading, clustered in the middle of the stem, oblanceolate-elliptic, acute or acuminate, 8–14 by (1.8–)2.4–3.5 cm, sessile, with an obscure pale semi-translucent border. Bract-like leaves 1–2, erect, lanceolate, 2.5–3.5 cm long, only basally sheathing, with a prominent or obscure pale and semi-translucent border, margins entire. Inflorescences lax, 8-flowered; rachis 14.5–22 cm long; floral bracts lanceolate, acuminate, 15–24 by 4–5 mm, slightly shorter than the pedicel plus the ovary, margins entire. Flowers to 31 mm across; pale green. Ovary (including pedicel) 26–30 mm long, smooth. Sepals oblong-elliptic, rounded to subacute, prominently and shortly mucronate, 3-veined; median sepal erect, 15–17 by 5–8 mm; lateral sepals spreading, similar but slightly shorter and narrower. Petals bilobed into an erect posterior lobe and a minute anterior lobe; posterior lobe erect, falcately-oblong, subacute, indistinctly 1-veined, 6–9 by ca 1 mm; anterior lobe reduced to a 0.6–1 mm long lobule, united with the lip base. Lip 17–20 mm long, deeply 3-lobed above a basal stalk 5–6 mm long, all lobes linear; midlobe 12–13 by 0.5–0.8 mm; side-lobes 12–14 by 0.6–1 mm; spur cylindric, 18–23 mm long, slightly geniculate, clavate in the apical half, ca 2 mm thick near the apex. Gynostemium ca 4.5 mm long; anther canals 1.7–2 mm long, straight, stigmas ca 3.8 mm long.

Thailand.— NORTHERN: Chiang Mai [Doi Inthanon, Garrett 4/0 (holotype K)] [1 collection seen].

Distribution.— Vietnam.

Ecology.— Evergreen forest; 1650 m altitude. Flowering: Sept.

Conservation.— In Thailand this species is only known from the type collection but it is also found in Vietnam. Based on its sporadic occurrence the conservation status in Thailand cannot be properly assessed. The species was listed in a book on threatened plants of Thailand (Suddee, 2005: 129). IUCN red list category ‘Data Deficient’ (IUCN, 2001).

Illustrations.— Seidenf., Dansk Bot. Ark. 31(3): fig. 39a–e. 1977.

Notes.— The species is very distinct with its fairly large flowers with mucronate lateral sepals and unequally-bilobed petals. Apparently it is related to Habenaria stenopetala and H. singapurensis Ridl. (Seidenfaden, 1977).


Terrestrial or rarely epilithic, deciduous, glabrous. Stems 95–130 cm tall, green with purple tinge. Cataphylls to 7, elliptic-lanceolate, tubular, sheathing, 1.8–4 cm long, enveloping the stem to 35 cm high. Leaves 9–11, spreading, clustered in the middle of the stem, lanceolate, acute, mucronate, 10–21 by 2–4.1 cm, once reported as dry at the flowering time. Bract-like leaves 7–10, erect, lanceolate, acute, 2.7–4.8 cm long, largely sheathing, sometimes with pale and papillose margins. Inflorescences dense or semidense, many-flowered; rachis 5–9 cm long; floral bracts lanceolate, acuminate, 13–27 by 2.5–3 mm, shorter or slightly longer than the pedicel, basal part with a pale semi-
translucent border. *Flowers* 8–10 mm across; green, greenish-brown, red or reddish-green, once reported as white. *Ovary* 9–12 mm long, smooth, with a narrow beak; pedicel sharply distinct from it, (10–)21–22 mm long, smooth. *Sepals* obtuse to subacute; median sepal reflexed, hooded, lanceolate to oblong-suborbicular, 3.8–6 by (2–)2.4–3.5 mm; lateral sepals spreading, obliquely-ovate, 4.1–7 by 2.5–3.5(–4) mm. *Petals* erect, deeply bilobed to near the base, both lobes entire; anterior lobe linear, 6–8(–10) by 0.2–0.5 mm; posterior lobe narrowly-lorate, 3.5–5(–6) by 0.3–0.9 mm. *Lip* 7–10.5 mm long, deeply 3-lobed to near the base, all lobes linear; midlobe 4.5–10 by 0.6–0.8 mm; side-lobes similar but slightly narrower; spur cylindric, 14.5–20 mm long, clavate in the apical third. *Gynostemium* 2.2–3 mm long, anther canals 1–2.5 mm long, straight projecting forwards, stigmas 1.7–2 mm long. *Fruit* ovoid-fusiform, ca 11 by 4.8 mm, with an elongate stalk.

Figure 2. Habenaria corymbosa E.C.Parish & Rchb.f.: a. inflorescence; b. flower; c. gynostemium and lip; d. petal; e. lateral sepal. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
Thailand.— NORTHERN: Chiang Mai [Doi Chiang Dao, Garrett 1475 (K); idem., Garrett 14/1 (K); idem., Kerr 324 (K); idem., Seidenfaden & Smitinand 3200 (C [s]); Doi Suthep, Sørensen et al. 6690 (C); idem., Nanakorn et al. 10548 (QBG [s]); idem., Niyomdhm & Hubat 1339 (BKF); idem., Seidenfaden & Smitinand 3301 (C [s]); Nan [Doi Phu Kha, Srisanga 1299 (QBG); idem., Srisanga 2334 (QBG)]; Lampang [Chae Son National Park, Maxwell 97-82 (SeCMU, SeCMU [s], L)]; Tak [Doi Pae Pae, Seidenfaden & Smitinand 7326 (C [s]); idem., Seidenfaden & Smitinand 7327 (C [s])]; NORTH-EASTERN: Loei [Phu Kradiueng National Park, Kerr 0928 (C [s], K)]; SOUTHWESTERN: Kanchanaburi [Thung Kang Yang Hills, Thai-Danish Botanical Studies 10555 (C [s])]; WITHOUT LOCALITY: Nanakorn et al. 16822 (QBG [s]) [16 collections seen].

Distribution.— Myanmar.

Ecology.— In evergreen forest near streams, also in rock crevices; 600–1900 m altitude. Reported over granite and limestone, sometimes in lateritic soils. Flowering: Jan.–March, May, July.

Conservation.— Known from 16 collections made in the north, north-east and south-west, with most of them made in national parks. IUCN red list category ‘Least Concern’ (IUCN, 2001).

Illustrations.— Seidenf. & Smitinand, Orchids Thailand: fig. 16a–d. 1959; Seidenf., Dansk Bot. Ark. 31(3): fig. 44a–e. 1977; present paper: fig. 2a–e.

Notes.— This species is very distinct with its narrow pedicels which are clearly differentiated from the much thicker ovary. One collector’s note indicates that the leaves were already dry and dead at the time of collecting which is probably a consequence of that particular individual flowering in the dry season.


Terrestrial, deciduous, glabrous. Stems 19–45 cm tall. Cataphylls 2–3, tubular, partly sheathing, widened in the upper part, enveloping the stem to 3.5 cm high, uppermost with a blade to 1 by 0.8 cm. Leaves 5–9, spreading, cauline and scattered on the stem, the largest in the middle of the stem and getting smaller towards the base and the top, elliptic-ovate or elliptic-oblanceolate, acute or obtuse, to 11.6 by 3 cm, margin slightly papillose. Bract-like leaves 0–4, erect, lanceolate-elliptic, acute, 1–2.5 cm long, margins entire or papillose. Inflorescences lax, 2–11-flowered (rarely up to 16-flowered); rachis 3.5–13 cm long; floral bracts ovate-lanceolate, acuminate, 15–23(–28) by 5–9(–10.5) mm, slightly shorter to longer than the pedicel plus the ovary, margins entire. Flowers 12–19 mm across; green and white, sepals white with greenish tips, lip green, gynostemium white, anther yellow. Ovary (including pedicel) 17–20 mm long, smooth. Sepals subacute to obtuse, 5-veined from the base; median sepal erect, suborbicular, 5.7–9 by 6–9 mm; lateral sepals obliquely ovate, (6–)7.5–10.5 by 2.5–4.5 mm, basally united with the petals and the lip. Petals suberect, deeply bipartite to near the base; posterior lobe narrowly strap-like, 3-veined, 6–11 by 0.5–1.9 mm; anterior lobe filiform, 1-veined, 6–10 by 0.5–0.7 mm. Lip 10–13 mm long, deeply and equally 3-lobed to about 1 mm from the base;
THE GENUS HABENARIA (ORCHIDACEAE) IN THAILAND (H. KURZWEIL) 23

all lobes filiform to narrowly linear, 9–12 by 0.5–0.75 mm; spur cylindric, swollen in the distal half, slightly curved forwards, 12–15 mm long. Gynostemium 2–4 mm long, anther ca 2.5 mm long, anther canals ca 2 mm long. Fruit elliptic-fusiform, about 16.8 mm long, 5 mm in diameter, without apical beak.

Thailand.— NORTHERN: Chiang Mai [Doi Suthep, Kerr 211 (holotype K); San Kam Phaeng District, Palee 331 (SeCMU, SeCMU [s], L)]; Lampang [Chae Son National Park, Maxwell 95-928 (SeCMU, SeCMU [s], L); no exact locality, Thaithong 1986 (BCU [s]); Phrae [Song, Maxwell 91-1029 (SeCMU, SeCMU [s])]; Tak [Mae Nun, Kerr s.n. (C [s] vial 212); no exact locality, Kerr s.n. (K H2006/01478-116)]; NORTH-EASTERN: Mukdahan [no exact locality, Thorat 184 (BCU [s])] [8 collections seen].

Distribution.— Vietnam.

Ecology.— Rare in bamboo forest and mixed forest, also found in disturbed areas; 225–1300 m altitude. Reported over shale bedrock. Flowering: June, Sept.–Dec.

Conservation.— Only seven collections from northern Thailand plus one from the north-east were examined here, but few of these are within national parks. IUCN red list category ‘Vulnerable’ based on geographic range and decline (B2a,b(iii); IUCN, 2001).

Illustrations.— Seidenf., Dansk Bot. Ark. 31(3): fig. 41. 1977.

Notes.— Habenaria amplexicaulis can be recognised by its green and white flowers which have bilobed petals with narrow and elongate segments. Unlike in the related H. corymbosa the ovary is not clearly differentiated from the pedicel. A similar species, H. thailandica, has been described recently (see below) which differs from H. amplexicaulis mainly by its smaller flowers (lip midlobe 9–12 mm in H. amplexicaulis, 5–7 mm in H. thailandica).

Habenaria amplexicaulis belongs to a group of species apparently related to H. digitata Lindl. which is centred in India and Sri Lanka. The taxonomic affinities within the group are not clear at the moment and have yet to be resolved. Seidenfaden (1977) pointed out that the distinction of H. amplexicaulis and H. thailandica from the Indian H. digitata will require a monographic study of the entire group which is best left to Indian workers who have easier access to material.


Terrestrial, deciduous, glabrous. Stems 44–50 cm tall. Cataphylls 2, tubular, largely sheathing, widened in the upper part, covering the stem to 5 cm high. Leaves to 12, spreading, cauline and scattered in the middle portion of the stem or all along it, broadly lanceolate to elliptic, acute, mucronate, (3.5–)8–12 by (1.7–)2.4–3.5 cm, green on both sides but lower surface much paler and sometimes silvery, margins often with papillae. Bract-like leaves absent. Inflorescences lax, many-flowered; rachis 8–15 cm long; floral bracts lanceolate, acute, (12.3–)20–27 by 0.7–3(–4) mm, longer than the pedicel plus the ovary, margins often with papillae. Flowers green or greenish white, petals and lip a few times reported as white, in a doubtful record flower described as pink, gynostemium
green, anther orange, pollinia light yellow. **Ovary** (including pedicel) 14–16 mm long. **Sepals** obtuse to subacute; median sepal erect, hooded, suborbicular to broadly ovate, 3.5–7 by 4–5 mm; lateral sepals spreading or recurved, obliquely lanceolate-ovate, slightly oblique, 5–8 by 2–4 mm. **Petals** suberect to spreading, deeply bilobed to near the base; posterior lobe with one strong and one weaker and shorter vein, 4–6 by ca 1 mm; anterior lobe 1-veined, 3.4–5 by 0.25–0.5 mm. **Lip** 6–7.5 mm long, deeply 3-lobed to near the base; midlobe linear to oblong, entire, 4–7 by ca 0.6 mm; side-lobes similar but shorter, spreading, 3.5–6 mm long; spur cylindric, 9–16 mm long, shorter than the pedicel plus the ovary. **Gynostemium** 2–3 mm long, anther loculi ca 2.2 mm long, anther canals ca 1 mm long, central rostellum lobe measuring about one third of the anther, stigmas ca 1.5 mm long.

**Thailand.—** NORTHERN: Chiang Mai [Doi Chiang Dao, Geesink et al. 5759 (holotype L); idem., Maxwell 89-749 (CMU)]; Phayao [Doi Luang National Park, Petitm 28 (ScCMU, SeCMU [s])]; Lampang [Chae Son National Park, Maxwell 96-747 (ScCMU, SeCMU [s], L)]; SOUTHWESTERN: Kanchanaburi [Thung Yai Naresuan Wildlife Reserve, Maxwell 93-669 (ScCMU, SeCMU [s]); Kanchanaburi [Sai Yok, Larsen et al. 10356 (C [s])]; SOUTHEASTERN: Chanthaburi [Pong Namron, Maxwell 75-475 (BK)]; PENINSULAR: Ranong [Ko Kum, Triboun 640 (l) (BK [s])]; ? LOCALITY ILLEGIBLE: *Kerr* 0191 (K) [9 collections seen, 1 of them uncertain].

Distribution.— Indochina.

Ecology.— Rare in dry deciduous or evergreen forest, often with bamboo; 20–645 m altitude. Reported over granite, shale and limestone. Flowering: (May–)June–July, Oct.

Conservation.— *Habenaria thailandica* is known from nine widely scattered collections made in all regions in Thailand except the north-eastern, eastern and central. Most of the collections come from national parks or wildlife sanctuaries which gives the plants a certain amount of protection. IUCN red list category ‘Least Concern’ (IUCN, 2001).


Notes.— This is another species in the group around the mainly Indian *Habenaria digitata*, differing from the previous taxon *H. amplexicaulis* by its smaller flowers. For brief comments see above.


Terrestrial, deciduous, glabrous except for sometimes the tips of the leaves. **Stems** (26–)32–70 cm tall. **Cataphylls** 3, tubular, sheathing, enveloping the stem base to 7 cm
high, uppermost sometimes with a blade to 0.8 by 0.7 cm. Leaves (3–)5–7, spreading, cauline and scattered along the stem, narrowly lanceolate-oblong, acute or acuminate, mucronate, 6–14(–20) by 1.5–3.3 cm, with three pronounced veins, surface glabrous or very rarely with sparsely scattered yellow hairs near the tip, margins entire or papillose. Bract-like leaves not present. Inflorescences lax to semi-dense, (2–)4–10-flowered; rachis (3–)5–17 cm long; floral bracts lanceolate, acuminate, 22–45 by 6–12(–19) mm, longer than the pedicel plus the ovary, margins papillose. Flowers 34–43(–55) mm across; with pale yellow green or greenish-white tepals, petals sometimes partly white, lip claw whitish, gynostemium pale green. Ovary (including pedicel) 19–30(–33) mm long, with papillose to shortly glandular-hairy keels. Sepals subacute, acuminate; median sepal erect, elliptic, 5-veined, 19–28 by 8–15(–20) mm; lateral sepals spreading, elliptic-lanceolate, 3-veined, 19–27 by 6–7.5(–9) mm. Petals erect, forming a hood with the median sepal, 3-veined at the base, ovate-lanceolate, acute, with a broadly rounded lobe on the lower part of the anterior side, 20–26 by 8–11 mm, sometimes with elongate papillae on the front margin. Lip 22–35 by 15–20 mm, deeply 3-lobed above the 9–12 mm long stalk; midlobe linear to oblong, 15–18(–25) by 1.3–2 mm; side-lobes fringed with linear to oblong main-branch with many filiform side-branches, main-branch 7–22 by 1–1.9 mm, side-branches 3–7 mm long, sometimes branched further; spur cylindric, 16–21 mm long, thickened apically. Gynostemium 3–5 mm tall, thecae situated on the far corners of an elongate horseshoe-shaped connective, anther canals 2–4 mm long, rather slender, strongly curved upwards, stigmas to 7 mm long, also curved upwards.

Thailand.— NORTHERN: Mae Hong Son [Doi Pui, Triboun 430 (l) (BK [s])]; Chiang Mai [Doi Suthep, Thai-Danish Botanical Studies 4557 (C [s]); idem., Kerr 92 (K); idem., Larsen et al. 46681 (AAU); idem., Maxwell 88-917 (CMU, L); ? idem., Maxwell 89-886 (in bud) (CMU); ? idem., Seidenfaden & Smitinand 2603 (in bud) (C [s]); idem., Seidenfaden & Smitinand 2704 (C [s]); idem., Seidenfaden & Smitinand 2705 (C [s]); idem., Smitinand & Sleumer 8300 (BKF); idem., Smitinand & Sleumer s.n. (BKF SN076972); idem., Sørensen et al. 4557 (BKF, C); idem., Sørensen et al. 4855 (C); Mae Rim, Nanakorn et al. 6981 (QBG); idem., Watthana 2418 (QBG, QBG [s]); Doi Pha Hom Pok, Damapong 97 (QBG [s]); Doi Pa Kao, Garrett 715 (BK, K, P); Chom Tong, Maxwell 92-579 (SeCMU, SeCMU [s]); Mae Wang, Maxwell 04-430 (SeCMU); Doi Chiang Dao, Pongamornkul 393 (QBG); idem., Seidenfaden & Smitinand 2816 (C [s]); Fang, Ach Boonit 17 (BK); Hot District, Pooma 1034 (BKF); Mae Sanam, Pooma s.n. (BKF [s]); Doi Pui, Songkakul 67 (BKF [s]); no exact locality, Sukhathan 1020 (BCU [s]); Nan [Doi Phu Kha National Park, Srisanga et al. 871 (QBG)]; Phitsanulok [Phu Soi Dao National Park, Sukhathan 2707 (QBG)] [28 collections seen, 2 of them uncertain].

Distribution.— Vietnam and China.

Ecology.— Found in open grassy pine forest and evergreen forest, also in open grassland; 1100–2000 m altitude. Several collector notes indicate granite as the bedrock. Flowering: July–Sept.

Conservation.— Recorded in a large number of localities in Mae Hong Son, Chiang Mai, Nan and Phitsanulok provinces in northern Thailand. IUCN red list category ‘Least Concern’ (IUCN, 2001).
Figure 3. *Habenaria limprichtii* Schltr.: a. inflorescence; b. flower; c.–e. gynostemium. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
Illustrations.— Seidenf. & Smitinand, Orchids Thailand: fig. 32, t. II (2697). 1959 [as Habenaria oligoschista]; Seidenf., Dansk Bot. Ark. 31(3): fig. 46a–e. 1977; present paper: fig. 3a–e.

Notes.— Habenaria limprichtii is very distinct with its large flowers (sepals 19–28 mm) and the lip with its fringed side-lobes, and cannot be mistaken for any other species in Thailand. The Thai specimens were first referred to H. oligoschista Schltr. following a Kew identification (Seidenfaden & Smitinand, 1959), but later studies showed that the plants are better listed under H. limprichtii which is followed here (Seidenfaden, 1977: 82).

Our Thai plant belongs to a group of about a dozen taxa related to the Himalayan Habenaria pectinata D.Don which is very much in need of a critical monographic study (Seidenfaden, 1977: 82). In his study of the Thai Habenaria species Seidenfaden pointed out that a future comprehensive study of all of the available material over the entire distribution range may well reveal that some of the currently recognised species in this group are merely forms of H. pectinata. Pradhan (1976: 72) indeed regarded our Thai species as conspecific with H. pectinata (as H. pectinata D.Don var. limprichtii (Schltr.) Pradhan) but no reasons for this transfer were given. It was very recently suggested by P. Ormerod that the identification of the Thai plants may not be correct as the type specimen of H. limprichtii has ligulate petals, while the basally dilated petals found in the Thai specimens rather match the concept of the Chinese H. yuana Tang & F.T.Wang which is another species in the H. pectinata group (P. Ormerod, pers. comm. to H. Pedersen in September 2007).


Terrestrial, deciduous, glabrous. Stems 30–38 cm tall. Cataphylls 2–3, tubular, erect, sheathing, sometimes with a blade to 8 mm long. Leaves 2–3, spreading or suberect, cauline and scattered in the lower stem half, narrowly oblong-elliptic, subacute, 4–8 by 0.3–1 cm. Bract-like leaves (0–)2–4, semi-erect or spreading, narrowly lanceolate, 1–4 cm long, shortly sheathing at the base. Inflorescences lax, 6–12-flowered; racis 5–12 cm long; floral bracts ovate-lanceolate, acuminate, 4–7 by 2–2.2 mm, much shorter than the pedicel plus the ovary. Flowers to 18 mm across; green. Ovary (including pedicel) 16–19 mm long, smooth. Sepals obtuse to subacute; median sepal erect, broadly elliptic, 3–5.5 by ca 2.8 mm; lateral sepals spreading, broadly ovate, 4–6 by 1.8–2.8 mm. Petals erect, forming a hood with the median sepal, triangular-oblong, subacute, 3–5 by 0.9–1.8 mm. Lip 8–12 mm long, deeply 3-lobed to ca 1.5 mm from the base; midlobe linear to oblong, 5–6 by 0.5–1.2 mm; side-lobes longer and deeply laciniate, with up to 7 laciniae, each lacinia 7–12 by ca. 0.3 mm long; spur cylindric, 11–15 mm long, clavate in the apical half, forwards bent. Gynostemium ca 2 mm long, anther thecae separated by a moderately wide connective, anther canals ca 1 mm long, stigmas to 2 mm long.

Thailand.— EASTERN: Chaiyaphum [Phu Khieo, Seidenfaden & Smitinand 8126 (C [s])]; Ubon Ratchathani [Pha Taem National Park, Boonjaras 303 (BCU); Soi
Sawan, Triboun 1375 (l) (KKU [s]); UNSPECIFIED: ‘Siam and Cambodia’, Godefroy 399 (holotype K; isotype P) [4 collections seen].

Distribution.— Cambodia and Vietnam.

Ecology.— Found in grassy places in evergreen oak forest; 250–900 m altitude. Flowering: June–July (–Aug.).

Conservation.— Found only infrequently in eastern Thailand (the above-listed collections and a photographic record from Ubon Ratchathani). The species was listed in a book on threatened plants of Thailand (Suddee, 2005: 130). IUCN red list category ‘Endangered’ based on geographic range and decline (B2a,b(iii); IUCN, 2001).


Notes.— This is a very rare species from eastern Thailand, characterized by fairly small flowers and fringed lip side-lobes with comparatively few laciniae.


Terrestrial, deciduous, glabrous. Stems 23–52 cm tall. Cataphylls 1–3, tubular, sheathing, enveloping the stem base up to 5.5 cm high. Leaves (3–)5–8, spreading, cauline and scattered in the lower stem half, lanceolate-elliptic, acute or acuminate, mucronate, 12–22 by 2–5.3 cm, with an obscure pale semi-translucent border. Bract-like leaves 3–6, spreading to erect, lanceolate, acuminate, 2.7–3.7 cm long, not or only shortly sheathing, with an obscure pale semi-translucent border, margins sometimes minutely denticulate. Inflorescences lax, 7–25-flowered; rachis 5–15 cm long; floral bracts lanceolate, acuminate, 15–32 by 3–5 mm, margins papillose or minutely denticulate. Flowers 17–20 mm across; sepals and spur green, petals green or white, lip white, anther light yellow. Ovary (including pedicel) 24–30 mm long. Sepals subacute to acute, 3-veined; median sepal erect, elliptic, 6–8 by 3–4.2 mm; lateral sepals spreading, obliquely ovate, 6–8–(10) by 3.5–5 mm, bas ally united with the petals and the lip. Petals erect, forming a hood with the median sepal, lanceolate-oblong, acute, 1-veined, 7–7.5 by 0.6–1 mm. Lip 12–20 by 17–20 mm, deeply 3-lobed above a basal claw 2–3.8 by 1.5–2.2 mm large, sometimes with
small lateral auricles, base with a collar in front of the spur entrance; midlobe narrowly oblong, 7–10 by 0.5–1 mm; side-lobes dissected into many linear laciniae 9–14 mm long; spur cylindric, 35–46 mm long, geniculate and thickened in the middle. *Gynostemium* 3–5 mm long, anther reflexed, anther canals ca 2 mm long, straight; auricles prominent, subulate and as high as or higher than the thecae.


Distribution.— Peninsular Malaysia (Kedah), Indochina and S China (Yunnan).

Ecology.— Found in mixed deciduous or evergreen forest, sometimes also in bamboo thicket; 100–375 m altitude. The bedrock is reported as granite. Flowering: Aug.–Nov. (–Dec.).
Conservation.— Known from 13 collections made in widely scattered localities in all regions except the east and south-west. IUCN red list category ‘Near Threatened’ (IUCN, 2001).


Notes.— Among the Thai taxa with entire petals and fringed lip side-lobes Habenaria mediolixa is the most distinct with its elongate subulate auricles which overtop the gynostemium.


Terrestrial or rarely epilithic, deciduous, glabrous except sometimes for the bract margins. Stems 19–40 cm tall. Cataphylls 3, tubular, sheathing, covering the stem to 4 cm high. Leaves (2–)4–5, spreading, cauline and scattered in the lower two thirds of the stem, lanceolate, acute or acuminate, mucronate, 8–15 by 2–2.5 cm, sometimes with insignificant pale semi-translucent border. Bract-like leaves 1–3, erect, lanceolate-ovate, acuminate, (2–)3–4.4 cm long, not sheathing, with prominent or obscure pale semi-translucent border, margins minutely denticulate or shortly glandular-hairy. Inflorescences lax, few-flowered; rachis 3–4 cm long; floral bracts narrowly lanceolate, acuminate, 15–25 by 2–5 mm, margins entire, elongate-papillose or shortly glandular-hairy. Flowers white with green sepals and petals, lip often with some red at the base. Ovary (including pedicel) 20–40 mm long. Sepals acute, 3-veined, often with papillose margins; median sepal erect, ovate, 8–8.5 by 4–4.2 mm; lateral sepals spreading to somewhat reflexed, obliquely ovate, 7.5–11.5 by 4.75–4.9 mm, basally united with the lip. Petals erect, forming a hood with the median sepal, linear, acute or obtuse, 1-veined, 7–8 by 0.5–1 mm, margins papillose. Lip 18–25 mm long, deeply 3-lobed above basal united part of 4.5–7 mm; midlobe linear-oblong, convex, more or less papillose, 4–8 by 0.7–1 mm; side-lobes 13–23 mm long, divided into 15–17 laciniae 11.5–20 by 0.25–0.3 mm long; spur cylindric, 31–40 mm long, often thickened in the apical half. Gynostemium 3.5–4.5 mm long, with a short basal stalk, anther erect, anther canals 1.7–3 mm long, straight projecting forwards; auricles rounded small bulges next to the anther.

Thailand.— NORTHERN: Tak [Mae Sot, Songkakul 124 (BKF [s]); Umphang, Triboun & illegible 1578 (I) (BK [s]); Kamphaeng Phet [Mae Lamung, Kerr 467 (K)]; WITHOUT LOCALITY: Pumicong 460 (QBG, QBG [s]); Thaithong 1224 (BCU [s]); Tiptabiankarn 6915 (Suan Luang [s]) [6 collections seen].

Distribution.— Laos and Vietnam.

Ecology.— Mostly unknown, once reported in a crevasse in limestone rock, 600 m altitude. Flowering: June–Sept.
Conservation.— Three collections from scattered localities in northern Thailand and three from unspecified localities are known, none of which appear to be situated inside nature conservation areas. IUCN red list category ‘Vulnerable’ based on geographic range and decline (B2a,b(iii); IUCN, 2001).


Notes.— In this treatment I follow Seidenfaden (1992: 60) and Vaddhanaphuti (2005: 166) who maintain Habenaria myriotricha as a separate species. Based on his recent studies Seidenfaden (1992) doubted his earlier opinion that H. myriotricha is conspecific with the Indonesian H. medusa Kraenzl. (Seidenfaden, 1972; 1973), but at the same time he pointed out that in the whole group of Habenaria species with laciniate lips the available material is too scarce for studies on the variability of the plants. Nevertheless, Kew’s World Checklist of Monocotyledons (http://www.kew.org/wcsp/monocots/), Schuiteman et al. (2008) and Cavestro (2007: 206) consider the two taxa as conspecific. Interestingly, neither of the two appear to occur in Peninsular Malaysia as H. myriotricha is known from Laos, Vietnam and Thailand while H. medusa is found in Sumatra, Java, Borneo and Sulawesi. Although such distribution gaps are indeed known to occur in plants, it adds further doubt to the possible conspecificity of the two taxa.

The differences between this species and the following Habenaria trichosantha are also very slight, both being characterised by narrow, entire petals, deeply dissected lips and gynostemia with rather low auricles. They seem to be distinguished merely by flower size: H. myriotricha has smaller flowers with median sepals measuring 8–8.5 mm in length, while H. trichosantha has median sepals longer than 10 mm.


Terrestrial, deciduous, apparently glabrous except for the bract margins. Stems 21–60 cm tall. Cataphylls tubular, 1–1.5 mm long, with wide mouth, upper with a blade to 2 cm long. Leaves 2–3–(4), spreading, cauline and scattered in the lower stem half, elliptic-ovate, acute, mucronate, 5–11 by 1.6–2.8 cm, sheaths to 2.2 cm long. Bract-like leaves suberect or spreading, linear-lanceolate, acuminate, 2–4 cm long. Inflorescences semidense, 6–9-flowered; rachis 5–7.8 cm long, glabrous; floral bracts lanceolate, acuminate to caudate, 16–25 by 3–4 mm, shorter than the pedicel plus the ovary, margins minutely denticulate to shortly glandular-hairy. Flowers 20–27 mm across; uniformly white. Ovary (including pedicel) 20–39 mm long. Sepals acuminate, 3- or 5-veined; median sepal erect, ovate-oblong, 10–15 by 3.5–4.5 mm, margins denticulate or shortly glandular-pubescent; lateral sepals reflexed, ovate-oblong to lanceolate, 12–16 by 4–6.5 mm. Petals suberect, cohering with the median sepal, linear-falcate, acuminate, 1-veined, 10–11 by 1.3–1.5 mm, margins entire or serrulate. Lip deeply 3-lobed above a short basal claw; midlobe linear-lanceolate, subacute, 7–11 mm long; side-lobes laciniate, laciniae filiform, 9–12 mm long; spur cylindric, to over 90 mm long, clavate. Gynostemium 2–3 mm long, anther
canals 1–2 mm long, auricles rounded small bulges next to the anther, stigmas short and globose.

Thailand.— NORTHERN: ? Sukhothai [Srichaleng, Kasem 259 (BK, C [s])] [1 doubtful collection seen].

Distribution.— NE India, Bhutan and Myanmar.

Ecology.— Unknown.

Conservation.— This is a very doubtful record of a widespread species. IUCN red list category 'Data Deficient' (IUCN, 2001).

Illustrations.— Seidenf., Dansk Bot. Ark. 31 (3): fig. 49a–d. 1977.

Notes.— The occurrence of this species in Thailand is in doubt. The only Thai collection, Kasem 259 (BK!) is unfortunately in a rather poor state, but differs from the otherwise very similar Habenaria myriotricha in its clearly larger flowers. While the original description makes no mention of the colour of the flowers, Pearce & Cribb (2002: 153) give the colour as ‘uniformly white’.


Terrestrial, deciduous, glabrous except for the bract margins. Stems (59–75–150 cm tall. Cataphylls 2–4, tubular, sheathing, enveloping the stem base up to 19 cm high, uppermost sometimes with a blade to 2 by 1.7 cm. Leaves 3–7, spreading or suberect, cauliined and scattered in the lower stem half, lanceolate-oblong, acute and sometimes mucronate, 8.3–18–(32) by 1.3–2.4–(3) cm, margins entire and mostly pale-translucent. Bract-like leaves up to 14, suberect, narrowly lanceolate, acute, 4.7–7–(11) cm long, the lower ones sheathing at the base, margins with coarse stiff hairs 0.2–0.4 mm long. Inflorescences lax, (7–)10–many-flowered; rachis 10.5–16–(21) cm long; floral bracts narrowly lanceolate, acute to acuminate, (19–)23–37–(62) by 2–4 mm, mostly shorter than the pedicel plus the ovary, margins with coarse stiff hairs 0.2–0.4 mm long. Flowers 18–20 mm across (excluding lip); white or greenish-white, turning brown with age. Ovary and pedicel 48–70 mm long, smooth. Sepals apically rounded or subacute, 3-veined from the base; median sepal erect, suborbicular, deeply hooded, (5–)5.8–7 by 6–8(–11) mm, hood 4–5.5 mm deep; lateral sepals spreading to reflexed, broadly ovate, 11–15 by 7–9.5 mm, more than twice as long as the median sepal, very oblique with a downward-pointing false apex while the true apex is 7–8.3 mm from the sepal base. Petals erect, oblong-ovate, obtuse, 3-veined, 5.2–7.2 by 3–3.6 mm. Lip over 30 mm long, deeply 3-lobed to 5–8 mm from the base; midlobe linear, entire, 22–37 by ca 1 mm; side-lobes linear to filiform, decurved in the distal three quarters, about as long as or slightly longer or slightly shorter than the midlobe; spur cylindric, 60–80 mm long, clavate in the distal 10–15 mm. Gynostemium 2.5–4 mm long, anther canals ca 7 mm long, angled upwards.
Thailand.— NORTHERN: Chiang Rai [between Kok Tong and Mae Kon, Garrett 297 (BKF, L, K)]; SOUTH-WESTERN: Kanchanaburi [Hin Dat, Put 95 (BK, C, K, L)]; CENTRAL: Lop Buri [Smitinand 12036 (BKF)]; SOUTH-EASTERN: Sa Kaek [Aranyaprathet, Kerr 0875 (K); idem., Put 1964 (K); idem., Put 3099 (BK, C, C [s], K, L)]; Prachin Buri [Watthanak Hong, Thorut 197 (BCU); no exact locality, Thaithong 751 (BCU [s], BCU)]; WITHOUT LOCALITY: Thaithong s.n. (BCU 005679) [9 collections seen].

Distribution.— India and Nepal to S China.

Ecology.— Found in grassy places in dipterocarp forest; 50–375 m altitude. Flowering: April, July–Sept.

Conservation.— This species is known from only nine collections made in widely scattered localities in northern, south-western, central and south-eastern Thailand. IUCN red list category ‘Vulnerable’ based on geographic range and decline (B2a,b(iii); IUCN, 2001).


Notes.— Habenaria commelinifolia is easily recognised by its robust growth (up to 1.5 m) and the large white flowers with their long narrow lip lobes which are all around 22–37 mm long. The lateral sepals of this and the following three species, H. longitheca, H. reflexa and H. austrorinensis, are very characteristic as they are much longer than the median sepal and are so strongly oblique that their front margin forms a downward-pointing false apex while the true sepal apex is close behind their base.


Terrestrial, deciduous. Stems 57–65 cm tall, glabrous below and with both very elongate papillae and stout grouped or branched hairs above. Cataphylls 3, tubular with wide opening, basally sheathing, erect, enveloping the stem to 6 cm high, glabrous. Leaves 4–6, spreading, caulete-elliptic, slightly acuminate, mucronate, 8–22 by (2–)3.5–6.5 cm, glabrous. Bract-like leaves 4–6, lanceolate, acuminate, 2.5–5.7 cm long, suberect or spreading and hardly sheathing, margins mostly elongate-papilllose to shortly glandular-hairy. Inflorescences lax, 30–35-flowered; rachis 30–35 cm long, hairy (see above); floral bracts lanceolate, acuminate, 18–34 by 5–7 mm, as long as or shorter than the pedicel plus the ovary, sometimes with very elongate papillae on the midrib, margins shortly glandular-hairy. Flowers 20–22 mm across; yellow-green. Ovary (including pedicel) 20–25 mm long, beaked, with very elongate papillae and stout grouped hairs. Sepals obtuse to subacute, 3-veined; median sepal erect, suborbicular, 2.5–3 by ca 3 mm, sometimes with papillae on the veins (especially the mid-vein); lateral sepals recurved, very obliquely ovate with the front margin forming a downward-pointing false apex while the true apex is ca 4 mm behind the sepal base, 11–14 by 4–6 mm, united with the median sepal and the lip base. Petals erect, curved-triangular, obtuse, forming a hood with the median sepal, 1-veined, ca 3 by 1.7 mm. Lip 28–32 mm long, 3-lobed above a united 4–4.5 mm long basal part;
midlobe terete, to 28 mm long, spiralling; side-lobes 6.7–9.3 mm long; spur with wide entrance followed by a constriction and above it a globular apex, 6–7 mm long, hidden between the recurved lateral sepals, globular apex ca 2.5 mm in diameter. Gynostemium ca 2 mm tall, anther canals 10–12 mm long, straight and projecting forwards, auricles as small bulges on the sides of the anther.

Thailand.— NORTHERN: Mae Hong Son [Doi Pa Kao, Garrett 68’/ (holotype K, isotype BKF)]; Chiang Mai [Doi Suthep, Kerr 353 (K); Mae Chaem, Kerr 494 (C [s], K)] [3 collections seen].

Distribution.— Endemic.

Ecology.— Found in dense evergreen forest, 960–1550 m altitude. Flowering: July–Aug.

Conservation.— Known from only three specimens collected in the provinces of Mae Hong Son and Chiang Mai (northern Thailand). It was listed in a book on threatened plants of Thailand (Suddee, 2005: 130). IUCN red list category ‘Endangered’ (Santisuk et al., 2006: 210).

Illustrations.— Seidenf., Dansk Bot. Ark. 31(3): fig. 52a–d. 1977.

Notes.— The species shares hairy stems and elongate straight and forward-projecting anther canals with Habenaria reflexa and H. austrosinensis, and the long lateral sepals with their downward-pointing false apex with both of these and H. commelinifolia.

The type collection of Habenaria longitheca and a second collection were originally listed as H. kingii Hook.f. by Seidenfaden and Smitinand (1959). However, it differs clearly in its anther canals which are longer than 10 mm and the short spur with its globular apex, and was therefore described as a new species by Seidenfaden (1977: 89).


Terrestrial or epilithic, deciduous. Stems 34–59 cm tall, glabrous below, with very elongate papillae and stout grouped or branched hairs above. Cataphylls 2–4, tubular, sheathing, enveloping the stem to 6 cm high, glabrous. Leaves 3–6, spreading, cauline and clustered in the lower third of the stem, broadly lanceolate-elliptic, shortly petiolate, acuminate, mucronate, 13–18 by 2.5–4.4(–5.3) cm, glabrous. Bract-like leaves 5–9, suberect, lanceolate, acuminate, 2–3 cm long, only basally sheathing, glabrous, margins mostly elongate papillose to shortly glandular-hairy. Inflorescences lax, (10–) 17–25-flowered; rachis (8.5–)14–25 cm long, hairy (see above); floral bracts lanceolate,
The genus *habenaria* (Orchidaceae) in Thailand (H. Kurzweil) acuminate, mostly 15–18 by 4–6 mm, shorter than the pedicel plus the ovary, sometimes with very elongate papillae on the midrib, margins shortly glandular-hairy. *Flowers* 10–15 mm across; light green, sometimes whitish. *Ovary* (including pedicel) 17–25 mm long, with very elongate papillae and stout grouped hairs, beak narrow. *Sepals* subacute, 3-veined; median sepal erect, suborbicular, 3–5 by 3–4 mm, occasionally with papillae on the veins (especially on the mid-vein) and on the margins; lateral sepals recurved, very

Figure 5. *Habenaria reflexa* Blume: a.–c. flowers from different specimens; d. petal. a. from the type specimen, b. from the type specimen of *H. murtonii* Hook.f. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
obliquely triangular-ovate with the front margin forming a downward-pointing false apex while the true apex is close to and behind the sepal base, basally united with the petals and the lip, 8–11 by 4–4.5 mm. *Petals* erect, broadly triangular, obtuse, forming a hood with the median sepal, 1-veined, 2.5–4 by 1.5–1.8 mm. *Lip* 10–15 mm long, deeply 3-lobed above the united 3.5–4 mm long basal part; midlobe terete, 6.5–14 by 1–1.5 mm long, spiralling; side-lobes similar, 6.2–7.5(–11) by 0.6–1 mm; spur cylindric, 15–18 mm long, thickened towards the apex, sharply curved forwards. *Gynostemium* 2–3 mm tall, anther canals 6–8 mm long, straight, projecting forwards. *Fruit* elliptic-fusiform, about 25 mm long, 3.7 mm in diameter, apical beak ca 10 mm long.

**Thailand.** — NORTH-EASTERN: Loei [Phu Kradueng National Park, Thai-Danish Botanical Studies 7329 (C, C [s]); idem., Seidenfaden & Smitinand 3722 (C [s]); idem., Smitinand 5849 (BKF, C [s]); no exact locality, Bunchuay 138 (BKF)]; PENINSULAR: Chumphon [Burkill s.n. (C [s] vial 324)]; Nakorn Si Thhamarat [Khiriwong, Phloenchit 191 (BKF); Thung Song, Rabil s.n. (C [s] vial 322); no exact locality, Rabil s.n. (K H2006/01478 63)]; Phatthalung [Khaopu Khao Ya, Larsen et al. 44034 (AAU, SING); Khao Pu Khao Ya National Park, Maxwell 86-711 (PSU)]; Songkhla [Rattaphum District, Maxwell 84-414 (BKF, PSU)]; Ton Nga Chang, Seidenfaden & Smitinand 9397 (C [s]); WITHOUT LOCALITY: Baramee s.n. (BCU [s] 009944) [13 collections seen].

Distribution.— Indochina and W Malesia, possibly also in India.

Ecology.— Found in limestone areas in evergreen or deciduous forest with rattan, also reported on rocks; 125–1200 m altitude. Flowering: July–Nov.

Conservation.— *Habenaria reflexa* is known from 13 collections made in widely scattered localities in north-eastern and peninsular Thailand, several of which are situated in national parks. IUCN red list category ‘Least Concern’ (IUCN, 2001).


Notes.— The species is well-characterised by its hairy stems, the oblique lateral sepals with their downward-pointing false apex, the strongly forwards-curved lip spur and the straight forward-projecting anther canals. The spur is the most obvious difference from the otherwise very similar *Habenaria austrosinensis* (where the spur is pointing straight backwards or upwards).


Terrestrial, deciduous. *Stems* 24–63(–80) cm tall, glabrous below and with very elongate papillae and stout grouped or branched hairs above. *Cataphylls* 4, tubular, sheathing, enveloping the stem base, 0.7–1.4 cm long, glabrous. *Leaves* 4–6, spreading, cauline and scattered on the stem in the lower part, lanceolate, acute, (14–)21–24 by (2.8–)3–5.9 cm, tapering into a narrow petiole to 5 cm long, glabrous. *Bract-like leaves*
8–10, lanceolate, acute or acuminate, 2–4 cm long, sheathing at the base, margins shortly glandular-hairy. Inflorescences lax, many-flowered; rachis 9–33 cm long; floral bracts acuminate-lanceolate, 12–21 by 2.2–4 mm, shorter than the pedicel plus the ovary, glabrous or papillose on the surface, with stiff white short hairs 0.2–0.4 mm long on the margins. Flowers 13–15 mm across; greenish-white, anther yellow. Ovary (including pedicel) 20–27 mm long, papillose or shortly glandular hairy. Sepals often with stiff short hairs on the margins; median sepal erect, suborbicular to broadly elliptic, 2.4–3 by ca 3 mm; lateral sepals recurved, very obliquely ovate with the front margin forming a downward-pointing false apex while the true apex is ca 3.8 mm behind the sepal base, 7–8 by 1.5–3 mm. Petals erect, forming a hood with the median sepal, linear, acute, 2.5–3.2 by ca 1 mm. Lip to 13 mm long, deeply 3-lobed to near the base, all lobes linear; midlobe ca 12 by 0.6 mm; side-lobes ca 8 by 0.3 mm; spur cylindric and apically clavate, 17–25 mm long, straight, pointing backwards and sometimes upwards. Gynostemium ca 3 mm long, anther canals 6.5–7.2 mm long, spreading, auricles insignificant.

Thailand.—NORTHERN: Chiang Mai [Chiang Dao, Suksathan 3581 (QBG, QBG [s])]; EASTERN: Nakhon Ratchasima [Wang Nam Khiao, Damrongsaik Prachat 788 (BKF); Khao Yai National Park, Larsen et al. 3234 (AAU, C [s], L, P)]; SOUTH-WESTERN: Prachuap Khiri Khan [Hua Hin, Middleton et al. 1063 (BKF [s])]; SOUTH-EASTERN: Prachin Buri [Kabinburi, Phengkhai 3046 (BKF)]; WITHOUT LOCALITY: Maxwell 90-868 (CMU) [6 collections seen].

Distribution.—S China.

Ecology.—Found in moist evergreen and bamboo forest; 400–1000 m altitude. Flowering: July–Aug. (–Sept.).

Conservation.—Known from only six collections made in widely scattered localities in northern, eastern, south-western and south-eastern Thailand. IUCN red list category ‘Vulnerable’ based on geographic range and decline (B2a,b(iii); IUCN, 2001).


Notes.—The species is similar to the preceding but differs by the long spur which is straight or only slightly curved and points backwards or upwards. Also the petals differ in the two species, H. reflexa having broadly triangular petals while those of H. austrosinensis are linear.


Epiphytic, deciduous, glabrous. Stems 18–27 cm tall. Cataphylls 2, tubular, sheathing, enveloping the stem base to 1.5 cm high, uppermost with a blade to 1.8 by 1.3 cm. Leaves 3–5, spreading, clustered near the base of the stem, lanceolate-elliptic, abruptly and shortly acuminate, mucronate, blade 6–12 by 2–3.7 cm, with an obscure pale border, margins papillose to elongate-papillose. Bract-like leaves 2, erect, lanceolate, acuminate, 1.9–3.6 cm long, not sheathing, margins elongate-papillose. Inflorescences lax, 7–13-flowered; rachis 7–13 cm long, glabrous, elongate-papillose or denticulate; floral
bracts lanceolate, acuminate, 11–19 by 5–7 mm, margins elongate-papillose to shortly glandular-hairy. Flowers mostly closed on the examined specimen, 6–7 mm long; green. Ovary (including pedicel) 14.8–16 mm long, with pronounced and occasionally slightly denticulate ribs. Sepals 2- or 3-veined, elliptic-ovate, margins papillose; median sepal erect, obtuse, 6–7 by 3–5 mm, with pronounced and occasionally slightly denticulate ribs; lateral sepals oblique, subacute, 6.5–7 by 3–4 mm, basally united with the lip. Petals erect, forming a hood with the median sepal, very narrowly triangular, subacute, 1-veined, 6.2–7 by 1.5–2 mm. Lip 8–8.3 mm long, deeply 3-lobed from near the base, lobes linear, obtuse; midlobe 5.5–6.4 by 0.9–1 mm; side-lobes 8.9–9.5 by 0.7–0.8 mm; spur cylindric and clavate in its distal half, curved forwards, 16.8–18 mm long. Gynostemium 3–4 mm long, anther canals 2–2.7 mm long, stigmas ca 2.5 mm long, auricles 2–2.5 mm from the base.

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**Figure 6.** cf. Habenaria ciliolaris Kraenzl. a. plant; b. tepals; c. gynostemium and lip spur. All from Srisanga et al. 851. Drawn by Teo Shaun Hao.
Thailand.— NORTHERN: Nan [Doi Phu Kha National Park, 19°24’N 101°07’E, Srisanga, Watthana & La-onsri 851 (QBG)] [1 doubtful collection seen].

Distribution (of typical Habenaria ciliolaris).— SE China and Vietnam.

Ecology.— Our Thai specimen was found growing as an epiphyte in evergreen hill forest; 1400 m altitude. Flowering: July.

Conservation.— IUCN red list category ‘Data Deficient’ (IUCN, 2001).

Illustrations.— Typical H. ciliolaris: Seidenf., Dansk Bot. Ark. 31(3): fig. 56a–b. 1977; Opera Bot. 114: fig. 29a–b. 1992; Thai specimen: present paper: fig. 6a–c.

Notes.— This plant closely matches Habenaria ciliolaris Kraenzl. from China and Vietnam. The Thai collection cited above shares with this species the subbasal leaves of a similar shape and size; the lax inflorescence; the size and shape of the median sepal, the petals and the lip; and the clavate and forwards-curved spur which is slightly longer than the ovary. Typical specimens of H. ciliolaris differ by having villous or hispid ridged stems, ciliate bracts, and ovaries with very prominent denticulate keels, three of which also continue on the median sepal (Kraenzlin, 1893; Seidenfaden, 1977; Chen et al., in prep.). Furthermore, the lateral sepals are less oblique in our Thai specimen than they are in the type specimen of H. ciliolaris. There appears to be some variation as in Taiwanese populations of the species no mention of the ridged ovaries is made in a recent flora treatment, and the bracts were referred to as merely “sometimes ciliate” (Digital Flora of Taiwan, http://www.efloras.org/florataxon.aspx?flora_id=100&taxon_id=200028691, accessed 30 April 2009).

Studies of the intraspecific variation of the hairiness of the stems and the floral bracts, as well as the extent of formation of the ridges on the ovary and the median sepal, are needed in order to determine whether the Thai specimen is an aberrant form of Habenaria ciliolaris or rather belongs to an undescribed species. If it is indeed H. ciliolaris this would be a new distribution record for Thailand.


Terrestrial, deciduous, glabrous but sometimes the margins and midribs of the bracts and the tepals short-hairy. Stems (26–)42–83 (–101) cm tall. Cataphylls 1–3,
tubular, sheathing, enveloping the stem base to 11 cm high, uppermost sometimes with a blade to 3 by 1.7 cm, with a distinct pale semi-translucent border. Leaves (2–)4–5(–7), spreading, caulisine in the lower stem half, broadly or more rarely narrowly ovate-elliptic, acute, mucronate, (6–)9–20 by 1.5–3.2(–5) cm, margins sometimes wavy. Bract-like leaves (3–)5–11, erect, narrowly lanceolate, acuminate, 2–7.5 cm long, not or very shortly sheathing at the base, margins mostly pale and papillose to stiff shortly hairy. Inflorescences lax to subdense, (2–)5–many-flowered; rachis (2–)4–8(–9.5) cm long, sometimes minutely denticulate especially below the floral bracts; floral bracts narrowly lanceolate, acute or acuminate, 10–33 by 2–6 mm, usually slightly shorter than the pedicel plus the ovary, margins and sometimes also the midribs papillose to shortly glandular hairy. Flowers 13–25(–29) mm across; normally entirely white (in singular cases recorded as pale blue, pinkish white, white with yellow lip or white with green sepals), outsides and apical parts of the inside of the sepals and petals as well as the lip spur sometimes with pale green tinge, gynostemium white or cream, pollinia pale yellow, tan or white; flower reported as scented or odourless; margins of sepals, petals and sometimes also the lip denticulate, papillose or shortly papillose-hairy. Ovary (including pedicel) 15–30 mm long, often with a narrow beak, keels pronounced and mostly papillose or shortly glandular-hairy. Sepals subacute or acute, sometimes mucronate, 5-veined; median sepal erect, ovate-elliptic, concave, (7–)8.5–13(–16) by (3.5–)4–9 mm; lateral sepals spreading, obliquely ovate, (7.5–)10–12(–17) by 3.4–5.5(–9) mm. Petals erect or spreading, narrowly lanceolate, acute, 3-veined, 5–9(–11.5) by (1.2–)1.7–2.8 mm. Lip (9–)11–25 by 2.5–17 mm, extremely variable in shape, deeply or shallowly 3-lobed with large or very small side-lobes, usually spreading, basally with a narrow claw (1–)2–7 mm long, with a prominent or insignificant wall-like rim around the spur entrance; midlobe narrowly or broadly oblong or narrowly triangular, acute, (3–)11–15(–22) by 0.7–3 mm; side-lobes spreading, flabellate or ovate, (0.5–)2.9–15(–22) by 1–10(–12) mm, margins mostly denticate; spur cylindric, usually 20–50 mm long, widening towards the apex, mostly geniculate, in abnormal forms (which are not uncommon) sometimes as short as 5 mm. Gynostemium (2.5–)3–5 mm long, anther canals 1.5–3 mm long and slightly pointing upwards, central rostellum lobe insignificant and up to half of the anther in length, auricles as small bulges on the sides of the anther, stigmas 2.3–3 mm long. Fruit subsessile, elliptic-tusiform, 19–26.9 mm long, 3.7–5.4 mm in diameter, beak to 6.4 mm long.

Thailand (selected specimens only).—NORTHERN: Mae Hong Son [Mae Sariang, Paisooksantivatana y 356-80 (BK); Pai, Larsen et al. 46931 (AAU, BKF)]; Chiang Mai [Doi Suthep, Kerr 119 (K); Mae Rim, Kerr s.n. (K H2007/02483-47); Mae Sa, Larsen et al. 46626B (AAU); Doi Pui, Maxwell 90-1108 (CMU, L); Doi Chiang Dao, Bunchuai 1195 (BKF); Fang, Bänzinger 531 (K); Hod, Sankamethawee 286 (SeCMU, ScCMU [s]); Omkoi, Petmitr 490 (SeCMU, ScCMU [s]); Doi Inthanon, Larsen & Larsen 34441 (AAU); Muang District, Maxwell 88-1205 (CMU, L); Huai Kayo, Maxwell 96-1210 (SeCMU, ScCMU [s], L); Wiang Haeng, Indhamusika 67 (QBQ); Mae Taeng, Maxwell 97-1316 (SeCMU, ScCMU [s]); Mae Wang, Maxwell 04-560 (SeCMU, ScCMU [s]); Amphoe San Pa Tong, Paisooksantivatana y 2559-89 (BK); Doi Pha Hom Pok, Triboun 396 (l) (BK [s]); Mae Taeng District, Shimizu et al. T 20168 (BKF)]; Chiang Rai [Khunkorn Waterfall Forest Park, Boonkerd et al. KK 675 (BCU); Wiang Pa Pao, Sidisunthom & Gardner 9001 (SeCMU, ScCMU [s])]; Nan [Amphoe Tha Wang Pha,
Larsen et al. 44356 (AAU, C [s]); Doi Phu Wa, Srisanga 1869 (QBG)]; Lamphun [Doi Khun Tan National Park, Maxwell 93-1280 (SeCMU, SeCMU [s]); Lampang [Chae Son National Park, Maxwell 96-1226 (SeCMU, SeCMU [s], L); Doi Khun Tan National Park, Cumberlege 634 (BKF); Chae Hom, Palee 1025 (SeCMU, SeCMU [s]); Phrae [Mae Tang, Kerr s.n. (K H2006/014/78-90); Uttaradit [Phu Soi Dao, Wongprasert et al. s.n. (BKF SN144371)]; Tak [Mae Sot, Triboun 725 (l) (BKF [s]); Umphang, Worachat 48 (KKU [s]); Sukhothai [Muang Kao District, Maxwell 71-684 (AAU, BK, C [s] AAU, BK, C [s]); Phitsanulok [Phu Hin Rong Kla, Suksathan 1215 (QBG)]; Kamphaeng Phet [Chong Yen Mae Wong National Park, Watthana 1463 (QBG); no exact locality, Kerr 222 (K)]; NORTH-EASTERN: Phetchabun [Nam Nao National Park, Thammatawon 131 (KKU [s]); Thung Salaeng Luang National Park, Kerr 0943 (BK, C, K)]; Loei [Phu Kradueng National Park, Dee 336 (BKF, C [s]); Phu Luang National Park, Thammatawon 133 (KKU [s]); Phu Rua National Park, Worachat 216 (KKU [s]); Wang Saphung, Bunnak 34 (BKF, C)]; Udon Thani [Phu Pra Bat National Park, Thammatawon 167 (KKU [s]); Sakon Nakhon [Phu Phan National Park, Smitinand s.n. (BKF SN105470)]; Mukdahan [Seidenfaden & Smitinand 5739 (C [s]); Khon Kaen [Huai Kae Waterfall, Thammatawon 104 (KKU [s]); EASTERN: Chaiyaphum [Pa Hin Ngam National Park, Suddee 167 (BCU [s]); Nakhon Ratchasima [Khao Yai National Park, v. Beusekom & Charoenphol 1771 (L); Ban Kaeng Khlo, Vital 5114 (P); Bua Yai, Put 4269 (BK, C, K); Wang Nam Khiao, Damrongsaik Praprat 210 (BKF)]; Ubon Ratthathani [Pha Taem National Park, Boonjaras 112 (BCU); Khong Chiam, Maxwell 01495 (SeCMU, SeCMU [s], L)]; SOUTH-WESTERN: Kanchanaburi [Erawan National Park, Suddee sub Kurzweil 2476 (BKF); Three Pagoda Pass, Kurzweil 2486 (BKF); Sai Yok, Phengklaif al et al. 14090 (BKF)]; Wangpho, Chermisiriwatthana 788 (BK)]; Huai Bankan, v. Beusekom et al. 3492 (BKF, C, L); Ratchaburi [Suan Phueng, Niyomdharm 6992 (BKF [s]); Prachuap Khiri Khan [Sam Roi Yot, Put 2523 (K)]; CENTRAL: Saraburi [Ban Nong Bua, Kerr 0650 (C, K); Sam Lan, Maxwell 73-567 (AAU, BK, BKF); Ban Nong Bua, Winit s.n. (BKF barcode SN2431/2)]; Nakhon Nayok [Khao Yai National Park, Shimizu et al. T 19760 (BKF, C [s]); SOUTH-EASTERN: Prachin Buri [Khao Yai National Park, Watthana & Riyapan 927 (QBG)]; Chonburi [Sriracha District, Maxwell 19-1034 (BK)]; Chanthaburi [Pong Namron, Bunnak 550 (BKF, C); Smitinand 3573 (BKF)]; Hidat, Smitinand 3560 (BKF); Ban Patong, Smitinand 3574 (BKF)]; PENINSULAR: Chumphon [Siap Khuan, Kerr 0658 (BK, C, C [s], K)]; Phangnga [Khao Bang Toi Tai, Triboun 100 (l) (BKF [s]) [150 collections seen, 1 of them uncertain].

Distribution.— N India and Nepal to Indochina and China, also in Peninsular Malaysia and possibly the Philippines.

Ecology.— Commonly found in primary or degraded deciduous, mixed or evergreen forest, pine forest, bamboo forest and fruit orchards, also in grassy and disturbed areas, sometimes also collected in fire-damaged habitats; 50–1800 m altitude. Habenaria dentata often grows in sandy soils derived from granite, shale and sandstone and has also been reported over limestone. Flowering: (July–)Sept.–Dec. (–Jan.).

Conservation.— Widespread and common throughout Thailand but apparently absent from the southern part of the Thai Peninsula (but found further south in Peninsular Malaysia). IUCN red list category ‘Least Concern’ (IUCN, 2001).
Figure 7. Habenaria dentata (Sw.) Schltr.: a. plant; b. flower; c.–d. gynostemium. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
Illustrations.— Seidenf. & Smitinand, Orchids Thailand: figs. 28, 29a–d. 1959; Seidenf. & Smitinand, Orchids Thailand: fig. 30a–d. 1959 [as Habenaria sp. TS 3574]; Seidenf., Dansk Bot. Ark. 31(3): fig. 60a–d. 1977; Seidenf. & Wood, Orchids Penins. Malaysia & Singapore: fig. 47e–g, t. 4c. 1992; present paper: fig. 7a–d.

Notes.— This is by far the most common Habenaria species in Thailand. It is characterised by cauline leaves and comparatively large white flowers with usually minutely denticulate sepal and petal margins. It is very widespread and is found in a wide variety of different habitat types. Not surprisingly, the morphological variation in H. dentata is extensive in a number of features, particularly in the lip shape (a range of different lip shapes was illustrated by Seidenfaden & Smitinand, 1959), but the variation appears to be continuous and a taxonomic grouping on the basis of this character cannot, therefore, be made.

Within the species there is a tendency towards the formation of abnormal flowers which is occasionally also found in Habenaria species in other parts of the world. The occurrence of abnormal individuals of H. dentata in Thailand was previously pointed out by Seidenfaden & Smitinand (1959). The inner perianth segments are absent in rare cases, and the spurs are occasionally reduced to as little as 5 mm. In the specimen Larsen 44356 (C [s]!) one of the petals is abnormal in that it has a short sac and is connate with the lip.

Habenaria malintana resembles H. dentata in several respects. The two species share a general appearance, a fairly large flower size and a white colour, frequently denticulate margins of sepals and petals and have a very similar gynostemium structure. However, H. malintana differs by having an unlobed and spurless lip. Both species frequently grow sympatrically as is shown by several mixed herbarium collections. In his study of the Thai Habenaria species Seidenfaden (1977: 101) pointed out that H. malintana and H. dentata are both in need of critical taxonomic study and suspected that the two species might subsequently turn out to be conspecific, with H. malintana being merely a peloric form of H. dentata. In view of molecular and other modern techniques available to us it is here considered premature to propose formal taxonomic changes based merely on morphological similarity and on the co-occurrence of the two taxa, and until such time as definitive evidence is available it is probably best to maintain H. malintana and H. dentata as separate species.

In the course of the present study a specimen labelled as “Habenaria dentata, form with an entire lip” (Suddee 801, BKF!) was re-identified as H. mandersii. It needs to be pointed out that, while the variation of lip shapes is enormous in H. dentata, forms with an entire and lorate lip have never been observed.

Figure 8. *Habenaria malintana* (Blanco) Merr.: a. plant; b. flower; c. gynostemium and lip; d. section through gynostemium; e. pollinium. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
THE GENUS HABENARIA (ORCHIDACEAE) IN THAILAND (H. KURZWEIL)

Terrestrial, deciduous, glabrous but sometimes margins and midribs of bracts and tepals as well as the ovary ribs variously short-hairy. **Stems** 45–50(–77) cm tall. **Cataphylls** 1–3, tubular, sheathing, enveloping the stem base to 11 cm high, uppermost sometimes with a blade to 3 by 1.7 cm, with distinct pale semi-translucent border. **Leaves** (2–)4–5(–7), spreading, cauline and scattered in the lower stem half, broadly or more rarely narrowly oblance-elliptic, acute, mucronate, 4–12 by (1–)2–3(–4.5) cm, margins sometimes wavy. **Bract-like leaves** (3–)5–11, erect, narrowly lanceolate, acuminate, 2–7.5 cm long, not or very shortly sheathing at the base, margins mostly pale and papilllose to stiff shortly hairy. **Inflorescences** lax to subdense, (2–)5– many-flowered; **Gynostemium** 3–5 mm long, anther canals 1–1.5 mm long and slightly facing upwards, central rostellum lobe insignificant and merely up to half of the anther in length, auricles small bulges on the sides of the anther, stigmas 2.3–3 mm long. **Fruit** elliptic-fusiform, about 3.6 mm long and 3 mm in diameter.

Thailand.—**NORTHERN**: Mae Hong Son [Pai, Larsen et al. 46931 (AAU, BKF); Pang Ma Pha, Pilenk et Triboun 574 (l) (BK [s]); Kong Loi village, Thaithong 765 (BCU)]; Chiang Mai [Doi Suthep, Kerr 119A (L); idem., Kerr 119C (K); idem., Kerr 119D (P); idem., Kerr 119E (K); idem., Maxwell 87-1324 (BKF, CMU); idem., Pimchai 9741 (C [s]); idem., Seidenfaden & Smitinand 3012 (C [s]); idem., Watthana 2158 QBG [s]; Mae Rim, Indhamusika 154 (QBG); idem., Nanakorn et al. 225 (QBG); Doi Chiang Dao, Phusomsaeng 13 (C [s], L); idem., Maxwell 89-1446 (CMU); idem., Maxwell 90-1187 (CMU); idem., Phloenchit 885 (BKF); Hot District, Cumberlege 1285 (K [s]); Hod, Saemyarn s.n. (QBG [s] 27107); idem., Sankamethawee 319 (SeCMU); Omkoi, Smitinand 11833 (BKF); near Doi Inthanon, Tagawa et al. T 2319 (BKF); Mae Klang, illegible s.n. (BKF SN076929); Mae Dtag, Maxwell 97-1303 (SeCMU, SeCMU [s]); no exact locality, Thaithong 516 (BCU [s]); Chiang Rai [Doi Luang National Park, Maxwell 97-1201 (SeCMU, SeCMU [s]); Mae Fa Luang, Maxwell 06-787 (ScCMU, SeCMU [s]); ? Khunkorn Waterfall Forest Park, Boonkerd et al. KK s.n. (fruiting) (BCU 010430)]; Nan [Amphoe Tha Wang Pha, Larsen et al. 44358 (AAU)]; Lamphun [Doi Khun Tan National Park, Maxwell 93-1242 (SeCMU, SeCMU [s]); Lampang [Chae Son National Park, Maxwell 95-927 (BKF, SeCMU, SeCMU [s], L); Doi Khun Tan National Park, Cumberlege 629 (BKF, C [s]); idem., Cumberlege 632 (BKF); Chaehom, Panatkool 416 (SeCMU)]; Sukhothai [Muang Kao District, Maxwell 71-684 (AAU, BK,
C [s]]; Kamphaeng Phet [Mae Wong National Park, v. d. Bult 6004 (SeCMU, SeCMU [s, L]); idem., Watthana 1483 (QBG [s])]; NORTH-EASTERN: Loei [Phu Luang National Park, Norsangsri 1096 (QBG); idem., Norsangsri 1101 (QBG); Phu Rua National Park, KKU 1435 (KKU [s]); idem., Worachar 371 (KKU); Phu Khum Thong, Dee 917A (BKF)]; EASTERN: Nakhon Ratchasima [Pak Thong Chai, Phengnaree 328 (BKF)]; PROVINCE NOT SPECIFIED: Thung Salaeng Luang National Park (Phitsanulok or Phetchabun), Phusomsaeng et al. 79 (BKF); WITHOUT LOCALITY: Nanakorn et al. 12680 (QBG [s]) [45 collections seen, 1 of them uncertain].

Distribution.— NE India to Indochina and the Philippines.

Ecology.— Found in evergreen, deciduous and pine forest with bamboo, frequently growing together with Habenaria dentata, also reported from sandy and disturbed areas; 300–1300 m altitude. Granite, limestone and phyllite were indicated as the bedrock. Flowering: July–Nov. (–Jan.).

Conservation.— Widespread and common in northern Thailand and also in the western parts of north-eastern and eastern Thailand. IUCN red list category ‘Least Concern’ (IUCN, 2001).

Illustrations.— Seidenf. & Smitinand, Orchids Thailand: fig. 13a–d. 1959; Seidenf., Dansk Bot. Ark. 31(3): fig. 79a–e. 1977; present paper: fig. 8a–e.

Notes.— Habenaria malintana is an unmistakeable species with its comparatively large white flowers (median sepals 9.7–17 mm) with unlobed lips and without a spur. For the possible relationship with H. dentata, see above.


Terrestrial, deciduous, glabrous except for the sepalas and the lip. Stems (15–)24–44(–50) cm tall. Cataphylls 2, tubular, sheathing, enveloping the stem up to 3 cm high. Leaves 3–5(–6), subradical, in a basal cluster and adpressed to the ground, broadly ovate, acute or acuminate, mucronate, 4.8–10(–15) by (2.1–)3–6(–8.5) cm, sometimes with an obscure pale semi-translucent border. Bract-like leaves (4–)6–10(–12), erect but tips often spreading, lanceolate, acute or acuminate, 1.4–3.5 cm long, with an obscure pale and semi-translucent border, margins entire, mostly enveloping the stem as an open sheath. Inflorescences lax to semi-dense, (2–)5–25-flowered; rachis (2–)5–15 cm long; floral bracts lanceolate, acuminate, 12–29 by 3–4(–6) mm, shorter than the pedicel plus the ovary, margins entire. Flowers (15–)17–25.5 mm across; white with greenish spur apex, base of lip midlobe greenish or with yellow-green markings, tepal outsides sometimes
with a green tinge, gynostemium white; flowers scented. *Ovary* (including pedicel) (22–) 25–34 mm long. *Sepals* rounded to subacute; median sepal erect, ovate-elliptic, 5-veined, 7–10 by (3–)4–7 mm; lateral sepals spreading, elongate-elliptic, 3-veined at the base and 7–10-veined above, 12–22–(24) by 6–10.5 mm, upper surface sometimes with short white scale-like hairs. *Petals* erect, forming a hood with the median sepal, triangular-oblong, acute, 1-veined, 7–11 by 1.7–3 mm. *Lip* (13–)15–25 mm long, 3-lobed from the base, with a collar to 1.5 mm high around the spur entrance, upper surface and sometimes also the margins with short white scale-like hairs; midlobe ovate-lanceolate, 3-veined, (11–)13–23 by 2.9–6 mm; side-lobes subulate, 3–6–(8) by 0.7–1.2(–1.5) mm; spur cylindric, (25–)31–40 mm long, slightly thickened in the upper two thirds. *Gynostemium* 3–4.5 mm long, anther loculi diverging towards the base, anther canals slender, 3–6 mm long, geniculately angled upwards, central rostellum lobe large, about two thirds of the anther in height, stigmas 3–4 mm long.

Figure 9. Habenaria lindleyana Steud.: a. plant; b. flower; c. lip and gynostemium; d. gynostemium; e. section through gynostemium. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
Distribution.— Laos and Vietnam.

Ecology.— This species is found in damp or dry soil in evergreen and mixed deciduous forest, pine forest and bamboo forest, often in open or disturbed areas or among rocks; 10–900 m altitude. Collector’s notes indicate sandstone, granite, shale and limestone as the bedrock. Flowering: (June–)Aug.–Oct. (–Dec.), once recorded in April.

Conservation.— Widespread and common in the northern half of Thailand, with one record on the Thai Peninsula (exact locality not known). IUCN red list category ‘Least Concern’ (IUCN, 2001).

Illustrations.— Seidenf. & Smitinand, Orchids Thailand: fig. 27a–c. 1959 [as Habenaria columbae]; Seidenf., Dansk Bot. Ark. 31(3): fig. 61a–e. 1977; present paper: fig. 9a–e.

Notes.— Habenaria lindleyana is a common species in the northern parts of Thailand and can easily be recognised with its rosette of broad leaves adpressed to the soil and the large white flowers with lateral sepals that by far exceed the median sepal in length. Also the lip shape with its ovate-lanceolate midlobe and the much shorter subulate side-lobes is very characteristic.

The type collection of the conspecific Habenaria columbae was made somewhere in the Thai Peninsula.

The country of origin of Lindley’s type of Habenaria latifolia, cited as Ceylon (= Sri Lanka), is probably a mistake as discussed by Seidenfaden (1977).


Terrestrial, deciduous, glabrous except sometimes for the bract margins. Stems (28–)41–75 cm tall. Cataphylls 1–3, tubular, sheathing, enveloping the stem base to 5 cm high, uppermost often with a blade to 5 by 2.5 cm. Leaves (2–)4–5(–6), spreading, cauline and clustered in the lower quarter of the stem, lanceolate-elliptic, slightly petiolate, acute, acuminate or rarely obtuse, mucronate, (6–)12–27 by (1.5–)5–6.7 cm, sometimes with an obscure pale border. Bract-like leaves (5–)6–10(–16), erect to suberect, lanceolate, acuminate, 1.3–2.7(–4) cm long, not sheathing, margins entire, minutely denticulate or shortly glandular-hairy. Inflorescences semi-dense, many-flowered; rachis (11–)15–30(–37) cm long; floral bracts lanceolate, acuminate, (7–)11–23 by 2–5 mm, shorter or longer than the pedicel plus the ovary, margins often shorter glandular-hairy. Flowers (6–)9–15 mm across; green, greenish white or yellow-green, gynostemium light green, anther
Fig. 10. *Habenaria lucida* Wall. ex Lindl.: a. plant; b.–c. flower; d.–e. gynostemium; f. pollinarium. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
yellow. Ovary (including pedicel) 15–20 mm long. Sepals rounded, 3-veined; median sepal erect, suborbicular, 3.5–5.1 by 2.7–4(–5.5) mm; lateral sepals reflexed, ovate-elliptic, 4–6 by 1.7–3.5 mm. Petals erect, forming a hood with the median sepal, triangular-oblong, obtuse or truncate, veins not prominent, 3.3–4.5 by 1.5–2.8 mm. Lip 4–6 mm long, deeply 3-lobed from the base, lobes elliptic-oblong, obtuse, fleshy; midlobe 3.5–5(–6) by 1.2–3.2 mm, curved upwards and adnate to the tips of the petals and the median sepal; side-lobes oblong-elliptic, 3.5–6(–8) by 1.2–2.5 mm, fleshy, recurved; spur cylindric, 16–25 mm long, longer than the ovary. Gymnostemium 2.3–3 mm long, anther reflexed, anther canals very short, stigmas stout, to 1.2 mm thick.

Thailand.— NORTHERN: Mae Hong Son [Mae Sariang, Pumicong 413 (QB, QBG [s]); Khun Yuan, Larsen & Larsen 34216 (AAU, P, L)]; Chiang Mai [Doi Suthep, Garrett 1357 (K); idem., Kerr 190 (holotype of Habenaria recurva K, isotype L); ? idem., Maxwell 89-981 (in bud) (CMU); idem., Sorensen et al. 4790 (C); idem., Seidenfaden & Smitinand 2658 (C [s]); idem., Seidenfaden & Smitinand 2698 (C [s]); Mae Chaem, Kerr s.n. (K H2007/02483-55); idem., Kerr s.n. (BK barcode SN243218); Hang Dong, Maxwell 87-908 (CMU, L); San Kam Phaeng, Maxwell 89-966 (CMU); idem., Maxwell 96-1165 (SeCMU, SeCMU [s], L); Doi Chiang Dao, Maxwell 90-1044 (CMU); Omkoi, Pumicong 379 (QB, QBG [s], SING)]; Phayao [Doi Luang National Park, Phet in 149 (ScCMU)]; Lamphun ['? Doi Khun Tan National Park, Maxwell 93-1086 (in bud) (ScCMU, ScCMU [s]); idem., Maxwell 94-929 (BKF, ScCMU, SeCMU [s], L)]; Lampang [Chae Son National Park, Maxwell 95-541 (BKF, ScCMU, SeCMU [s], L)]; idem., Maxwell 95-750 (SeCMU, ScCMU [s]); idem., Maxwell 96-1150 (BKF, SeCMU, ScCMU [s], L); Doi Luang National Park, Maxwell 97-940 (BKF, ScCMU, ScCMU [s]); Phrae [Mae Ban, Franck 1473 (C, L)]; Tak [Mae Sot District, Maxwell 94-895 (ScCMU, ScCMU [s], L); Umphang, Seidenfaden & Smitinand 7847 (C [s]); idem., Worachat 49 (KKU [s])]; NORTH-EASTERN: Phetchabun [Thung Salaeng Luang National Park, Kerr 0942 (BK, C, K)]; Udon Thani [Phu Pra Bath National Park, Thammatawong 168 (KKU [s])]; Sakon Nakhon [Phu Phan National Park, Auemporn 11/1999 (KKU [s]); idem., Thammatawong 91 (KKU [s])]; EASTERN: Nakhon Ratnasima [Wang Nam Khiao, Damrongaks Praphat 192 (BKF)]; Ubon Ratchathani [Pha Taem National Park, Boonjaras 112 (BCU)]; SOUTH-WESTERN: Kanchanaburi [Erawan National Park, Suddee sub Kurzweil 2475 (BKF)]; ? Ban Erawan, Shimizu et al. T 21497 (in bud) (BKF); Thong Pha Phum, Kurzweil 2479 (BKF); idem., Wongprasert 998-05 (BKF); no exact locality, Robinson K245 (K [s]); CENTRAL: Saraburi [Muang District, Maxwell 74-767 (AAU, BK, C [s], L)]; SOUTH-EASTERN: Prachin Buri [Ban Beung, Cumberlege 873 (C [s], K, K [s]); Ban Bung hills, Larsen et al. 1141 (AAU); no exact locality, Songkakul 28 (BKF [s]); idem., Thaithong 467 (BCU, BCU [s]); LOCALITY ILLEGIBLE: without collector (K 2007/02483-53); WITHOUT LOCALITY: KKU 1064 (KKU [s]); idem., Pumicong 513 (QB, QBG [s]) [45 collections seen, 3 of them uncertain].

Distribution.— Myanmar, Indochina and S China.

Ecology.— Found mostly in deciduous and bamboo forest and frequently in areas of mild disturbance, rarely in evergreen forest; sometimes reported near streams or on rocky ground; 50–1300 m altitude. Shale and limestone have been noted as the bedrock. Flowering: (June–)Aug.–Sept. (=Nov.).
Conservation.— Widespread and common in the northern half of Thailand. IUCN red list category ‘Least Concern’ (IUCN, 2001).


Notes.— The most obvious diagnostic character of the species is the lip midlobe of the small green flowers which is curved upwards and adnate to the tips of the petals and the median sepal. Also the reflexed oblong-elliptic lip side-lobes and the long thin spur are very characteristic.

A specimen at K (sine collector, K 2007/02483-53!) is rather atypical in the small plant size (28 cm) and in its narrow leaves (to 1.5 cm) but agrees with Habenaria lucida very well in all other characters.


Terrestrial, deciduous, glabrous except for the bract and tepal margins. Stems (17–)24–30(–52) cm tall. Cataphylls 2–4, tubular, sheathing, 0.8–3.4(–5) cm long, apical part spreading and often with a small acute and mucronate blade to 2 by 1.5 cm, often with pale border. Leaves (1–)2–3, spreading, cauline and scattered in the lower stem half, lanceolate-oblong, acute, mucronate, 3–13(–19) by 0.4–2.2 cm, mostly with pale and semi-translucent border. Bract-like leaves 6–11(–15), suberect or spreading, narrowly lanceolate, acuminate, sheathing at the base, 1.4–4.5(–8.5) cm long, with stiff short hairs or elongate papillae on the margins, sometimes with pale and semi-translucent border. Inflorescences lax to subdense, 10–18-flowered; rachis 2.5–5(–6) cm long; floral bracts lanceolate, acuminate, 9–18(–25) by 1.3–2.2 mm, almost always with stiff short hairs on the margins. Flowers 8–10 mm across; yellow to greenish yellow, white or orange, once also recorded as brown with yellow lip, spur often green in the upper half; sometimes the sepals and less often also the petals with stiff short hairs on the margins; flowers once reported as fragrant. Ovary (including pedicel) 8–16(–24) mm long, smooth. Sepals subacute, 3- or several-veined; median sepal erect, ovate-lanceolate, 3–5.2 by 2–5 mm; lateral sepals recurved, more or less strongly obliquely ovate-lanceolate, 5–7 by 2.7–4.5 mm. Petals erect, oblong, obtuse, 1- or 2-veined, cohering with the median sepal, 3.5–4.8(–5) by 0.9–2.1(–2.6) mm, sometimes papillose on the margins. Lip 6–12 by 2.5–5.5 mm, 3-lobed to the base, with a prominent collar in front of the spur entrance; midlobe linear to oblong, 5–10(–12) by 0.5–0.9 mm; side-lobes linear, 1–3 by 0.3–0.6(–0.8) mm, shorter than the midlobe and ranging from about one third to one half of its length; spur cylindric, elavate in the upper third, shorter than the pedicel and the ovary, 7–19 mm long. Gynostemium 2.2–4 mm long, anther erect, anther canals ca 2 mm long, central rostellum lobe about half as long as the anther.
Thailand.— NORTHERN: Mae Hong Son [Khun Yuam, Larsen & Larsen 34090 (AAU, B, BKF, K)]; Huai Hei, Triboun 219 (l) (BK [s])); Chiang Mai [Kerr s.n. (C [s] vial 150)]; Phitsanulok [Chattrakan District, Wongnak 100 (QBG [s]); no exact locality, Smitinand s.n. (BKF SN114282)]; NORTH-EASTERN: Phetchabun [Thung Salaeng Luang National Park, Kerr 0945 (BK, C [s], K); Nam Nao National Park, Shimizu et al. T 18295 (C [s])); Loei [Phu Kradueng National Park, Din Nakkaru 155 (BK)]; idem., Prakop Burma 62 (BKF); Kalasin [Phu Sing, Sakol 3489 (BK)]; EASTERN: Chaiyaphum [Phu Khiao, Phengklai et al. 12302 (BK)]; no exact locality, Thaithong 865 (BCU [s]); Surin

Figure 11. Habenaria acuifera Wall. ex Lindl.: a. plant; b., e. flower; c. gynostemium; d. lip and gynostemium. e. from the type specimen. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
[Thatum, *Sakol 2093* (BK, C [s]); Ubon Ratchathani [Phibun Mangsahan, *Pooma et al. 2210* (BKF, L); Pho Sai District, *Suddee 789* (BKF [s]); *Without Locality: Comber 1608* (K); *Tiptabiankarn 1194* (Suan Luang [s]) [17 collections seen].

Distribution.— NE India to Indochina and S China, possibly also Peninsular Malaysia.

Ecology.— Occasionally found in evergreen forest, open deciduous dipterocarp forest and pine forest, also in grassy areas by the roadside or in swampy places; 50–1300 m altitude. Flowering: July–Sept.(–Nov.).

Conservation.— Known from 17 collections made in northern, north-eastern and eastern Thailand, with some of the localities situated in national parks. IUCN red list category ‘Least Concern’ (IUCN, 2001).

Illustrations.— *Seidenf., Dansk Bot. Ark.* 31(3): fig. 64a–e. 1977; present paper: fig. 11a–e.

Notes.— *Habenaria acuifera* is very similar to *H. chlorina* with its small and mostly yellow flowers and the comparatively short lip side-lobes but can easily be distinguished by the recurved or reflected and oblique lateral sepals and the collar around the spur entrance. It is also similar to the Chinese *H. linguella* Lindl. although this has a considerably longer spur.


Terrestrial, deciduous, glabrous except for the bract margins. *Stems* 12–30(–66) cm tall. *Cataphylls* 2–4, tubular, largely sheathing, enveloping the stem base to 7 cm high, with a free and spreading apical part, acute, mucronate, with a pale semi-translucent border, uppermost often with a small blade to 1 cm long. *Leaves* 3–5, spreading, cauline and scattered in the lower stem half, lanceolate-oblong, acute, mucronate, 4–17 by 0.4–1.1 cm, margins entire with pale semi-translucent border. *Bract-like leaves* 1–7, narrowly lanceolate, acute or acuminate, 1.4–5.5 cm long, erect or suberect, not or only basally sheathing and spreading above, margins with papillae or coarse stilt hairs 0.2–0.3 mm long, sometimes with an obscure pale border. *Inflorescences* lax or semi-dense, 6–30-flowered; rachis 2–8 cm long; floral bracts narrowly lanceolate, acute or acuminate, 11–17 by 1–2.5 mm, slightly longer than the pedicel plus the ovary, with marginal short hairs similar to those on the bract-like leaves. *Flowers* 8–10 mm across; mostly yellow and sometimes tinged with red, also reported as greenish with brown spots, or sepals brown and petals yellow, once reported as having a white lip, spur greenish yellow, gynostemium whitish, cream or greenish yellow; a few times reported as odourless. *Ovary* (including pedicel) 10–15 mm long, ridged but smooth. *Sepals* oblong-ovate, obtuse, several-veined, upper part often papillose on the margins; median sepal erect, hooded, 3.6–5 by 2.5–3.5 mm; lateral sepals usually spreading, not or only weakly oblique, 3-veined, 4–6 by 2.6–3.9 mm. *Petals* erect and forming a hood with the median sepal, ovate-oblong, obtuse, 1-veined, 3.7–5.5 by 1.2–2.4 mm, upper part often papillose on the margins. *Lip* 4–6(–7)
by 1.5–1.7 mm, deeply 3-lobed to near the base, without a raised ridge in front of the spur entrance; midlobe linear-oblong, 4.2–5.8 by 0.5–1.4 mm; side-lobes narrowly triangular, spreading, 2–3.8 by 0.4–0.8 mm; spur cylindric, widened at the base and clavate in the apical third, (8–)8.5–10.8 mm long. *Gynostemium* 2–3 mm long, anther canals 1–1.5 mm long, straight projecting forwards, stigma 1.5–1.8 mm long.

Figure 12. *Habenaria chlorina* E.C.Parish & Rchb.f.: a. plant; b.–c. flower; d. floral bract; e. median sepal; f. petal; g. gynostemium; h. section through gynostemium. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
Thailand.— NORTHERN: Mae Hong Son [Khun Yuam, Larsen & Larsen 34125 (AAU); Mae Sariang Road, Seidenfaden & Smitinand 5298 (C [s]); Mae La Noi, Srisanga & Puff 1040 (QBG)]; Chiang Mai [Doi Suthep, Kerr 236 (K); idem., Kerr 312 (K); idem., Seidenfaden 3034 (K [s]); Mae Jam District, Maxwell 96-1039 (BKF, ScCMU, SeCMU [s, L]); Omkoi, Maxwell 96-1069 (BKF, ScCMU, SeCMU [s, L]); idem., Pumicong 383 (QBG, SING); idem., Pumicong 384 (QBG, QBG [s]); Hod District, Sankamethawee 236 (SeCMU, SeCMU [s, L]); Mae Rim, Nanakorn et al. 9695 (QBG); Wieng Hang, Prateep Rojanadiloke s.n. (BKF [s]); Mae Taeng, Seidenfaden & Smitinand 3034 (C [s]); Mae Sanam, Smitinand s.n. (BKF SN076974); Mae Chaem, Seidenfaden & Smitinand 9546 (C [s]); Lamphun [Mae Lee, Winit 1239 (BK)]; Phrae [Mae Tang, Nanakorn et al. 1417 (QBG); idem., Sorensen et al. 4710 (BKF, C); idem., Sorensen et al. 4716 (BKF, C)]; Sukhothai [Khao Luang, Niymdham 3949 (BKF)]; NORTH-EASTERN: Phetchabun [Nam Nao National Park, Worachat 76 (KKU [s]); idem., Worachat 274 (KKU [s]); idem., Murata et al. T 51777 (BKF)]; Nong Khai [Thaithong 506 (BCU [s])]; Sakon Nakhon [Phu Phan National Park, Auemporn 7/1999 (KKU [s]); idem., Thammatawon 92 (KKU [s]); WITHOUT LOCALITY: KKKU 847 (KKU [s]); KKKU 905 (KKU [s]); Thorut 182 (BCU [s]); without collector (BKF [s]) [31 collections seen].

Distribution.— Myanmar and Laos.

Ecology.— Occasionally or common in moist or dry ground in dipterocarp, oak and pine forest, often in sandy soil; 350–1300 m altitude. Granite was noted as the bedrock. Flowering: mainly in Aug. and Sept., rarely recorded as late as Nov.

Conservation.— Widespread and common in northern and north-eastern Thailand. IUCN red list category ‘Least Concern’ (IUCN, 2001).

Illustrations.— Seidenf. & Smitinand, Orchids Thailand: fig. 18a–d. 1959; Seidenf., Dansk Bot. Ark. 31(3): fig. 63a–h. 1977; present paper: fig. 12a–h.

Notes.— This is a very distinct species, characterised by the 3-lobed lip with short side-lobes, the lack of any ornaments on the lip and the spreading lateral sepals which are not or only slightly oblique.


Terrestrial, deciduous, glabrous except for the bract and tepal margins. Stems (16–)23–50 cm tall. Cataphylls 2, to 2.5 cm long, tubular, erect, largely sheathing, with a spreading blade to 5 mm long, sometimes with a distinct pale semi-translucent border. Leaves 2–4, spreading, cauline and scattered in the lower stem half, narrowly oblanceolate-oblong, acute and often mucronate, 4.3–7(–13) by 0.5–1.4 cm, with a
THE GENUS HABENARIA (ORCHIDACEAE) IN THAILAND (H. KURZWEIL)

pale semi-translucent border. *Bract-like leaves* 5–8(–11), erect or suberect, lanceolate, acuminate, 2–4(–5.3) cm long, not sheathing, with a prominent or obscure pale and semi-translucent border, margins minutely denticulate to coarsely and shortly glandular-hairy. *Inflorescences* lax to semi-dense, (3–)5–17-flowered; rachis 1.6–3(–5) cm long; floral bracts lanceolate, acuminate, 10–15 by 1.8–3 mm, shorter than the pedicel plus the ovary, margins coarsely and shortly glandular-hairy. *Flowers* 10–15 mm across; mostly pale salmon-pink, pale brown or white, lateral sepals usually with large brown or green blotch in the middle, a few times flowers reported as having chocolate-coloured sepals and white petals, turning dark or to reddish-brown with age; once reported as fragrant; margins of median sepal and petals mostly minutely denticulate or coarsely and shortly glandular-hairy. *Ovary* (including pedicel) (17–)20–25 mm long, with a long beak. *Sepals* rounded to subacute, 3-veined; median sepal erect, suborbicular, 3.9–5.4 by 3–5 mm; lateral sepals reflexed, very obliquely ovate, 5.8–7.5(–8) by 3.3–5.4 mm. *Petals* erect, forming a hood with the median sepal, triangular-oblong, subacute, veins not prominent, 4–5 by 1–2.1 mm, united with the median sepal and the lip base. *Lip* 7–13 mm long, deeply 3-lobed above a short united part, with an obscurely 3-lobed pustulate erect tongue 3–4 mm long in front of the spur entrance which protrudes above the anther canals when seen from the side; midlobe linear to oblong, (5.5–)8–12 by 1–1.6 mm; side-lobes linear to oblong, (7–)8–10(–11.5) by 0.5–1 mm; spur cylindric, 15–23(–25) mm long, nearly as long as the ovary to slightly longer, geniculate, thickened apically. *Gynostemium* 3–4 mm long, anther canals 3–5 mm long, geniculately bent upwards at the middle, stigmas 3–4 mm long. *Fruit* sessile, elliptic-fusiform, to 25 by 4.5 mm, beak to 13 mm long.

Thailand.—NORTHERN: Chiang Mai [San Sai, Sørensen et al. 5027 (C, C [s])]; Doi Suthep, Kerr 121 (K), idem., Maxwell 89-1182 (CMU); idem., Sørensen et al. 4791 (C); idem., Sørensen et al. 5079 (C); ? Chiang Dao, Maxwell 89-1094 (in bud) (CMU); Mae Rim, Srisanga & Maknoi 2190 (QBG); no exact locality, Kerr s.n. (KH007/02483-85); Lamphun [Khun Tan National Park, Tagawa et al. 9218 (C [s])]; Phrae [Mae Tang, Seidenfaden 3022 (C [s])]; Sukhothai [Srichalieng, Kasem 258 (BK)]; NORTH-EASTERN: Phetchabun [Thung Salaeng Luang National Park, Marcan 2720 (BM)]; Loei [Sitam, Dee 183 (P)]; EASTERN: Chaiyaphum [Nong Bua Deng, Larsen et al. 31876 (AAU, K)]; SOUTH-WESTERN: Kanchanaburi [Thaithong 245 (BCU, BCU [s])]; CENTRAL: Lop Buri [Chaibadal, Maitri Banthoengsuk 15 (BKF)]; ? Saraburi [Ban Nong Bua, Put 1099 (K)]; SOUTH-EASTERN: Sa Kaeo [Aranya Pratth, Seidenfaden & Smitinand 8192 (C [s])]; Prachin Buri [Songkakul 103 (BKF [s])]; Rayong [Phu Khao Ya, Worachat 37 (KKU [s])]; Chanthaburi [Makam, Larsen 10085 (BKF, C [s])]; idem., Phengklai 1082 (BKF, L); idem., Seidenfaden & Smitinand 3563 (C [s]); idem., Seidenfaden & Smitinand 8188 (C [s]); idem., Smitinand s.n. (BKF SN077047); idem., Watthana 1379 (QBG [s]); Muang District, Maxwell 73-391 (BK); Trat [Smitinand 1328 (BKF)]; PENINSULAR: Chumphon [Sa Wee, Khompat KK1 (PSU)]; idem., Triboun & illegible 461 (l) (BKF [s]); no exact locality, Larsen et al. 1440 (AAU, BKF, L); idem., Suddee 320 (BCU [s]); idem., Thaithong 883 (BCU [s]); Surat Thani [Kanchanadit, Kerr 0426 (BK, K)]; Kantuli, Put 4202 (K); Nakhon Si Thammarat [Thung Song, Rabit 99 (C, K, L)]; Trang [Khao Chong, Sakol 3383 (BK)]; Sikao, Eiadthong W-5 (BKF); idem., Eiadthong s.n. (BKF [s]); no exact locality, without collector and number (holotype of Habenaria roseata SING); idem., Seidenfaden & Smitinand 8878 (C [s])]; Songkhla
Figure 13. *Habenaria rostellifera* Rchb.f.: a. plant; b. flower; c.–d. gynostemium; e. section through gynostemium.
Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
[Sado, *Kerr* 0617 (BK, K); Had Yai District, *Maxwell* 84-463 (BKF, C [s], PSU)]; Pattani [Bannang Sta, *Kerr* 049 (BK, K); idem., *Kerr* 049A (BK, K)]; UNSPECIFIED: ‘Siam and Cambodia’, *Godefroy* 737 (holotype K); LOCALITY AND COLLECTOR ILLEGIBLE: (K); WITHOUT LOCALITY AND COLLECTOR: s.n. (C [s] vial 341); s.n. (BKF [s]); BKF s.n. (BKF 18288) [50 collections seen, 2 of them uncertain].

**Distribution.**—Indochina, Peninsular Malaysia and S China.

**Ecology.**—Found in open places in deciduous forest, in scrub vegetation and in open savanna, also collected in paddy fields, marsh and scrub; from near sea level to 1120 m altitude. Granite is reported as the bedrock; occasionally the species is found on lateritic soils near sea-level. Flowering: June–Sept. (–Nov.).

**Conservation.**—Widespread and common throughout Thailand except the extreme eastern parts. IUCN red list category ‘Least Concern’ (IUCN, 2001).


**Notes.**—The prominent 3–4 mm long pustulate tongue in front of the rostellum of this species which is visible as a projecting structure above the anther canals is not found in any other Thai *Habenaria* species. Another easily visible diagnostic character is the lip with its three spreading linear and about equally long lobes and the fairly long anther canals which are geniculately bent upwards. Both *H. rostellifera* and the following species, *H. rostrata*, have ovaries with a prominent beak which can also be clearly seen in the fruiting stage.

The tongue in front of the rostellum is an outgrowth of the lip as shown by Seidenfaden (1977: 110). In the past this structure was sometimes regarded as part of the rostellum. In fact Reichenbach’s name *rostellifera* was coined after this perceived origin.


Terrestrial, deciduous, glabrous except for the bract margins and the ovary. *Stems* 17–38 cm tall. *Cataphylls* 2–4, erect, tubular, sheathing, enveloping the stem to 5 cm high, uppermost with a blade to 2 by 0.8 cm, with a distinct pale semi-translucent border. *Leaves* 2–4, spreading, cauline and scattered in the lower stem half, narrowly oblanceolate-oblong, acute, mucronate, 4.5–12 by (0.4–)0.8–1.4 cm, with a pale semi-translucent border. *Bract-like leaves* 6–9(–11), erect or suberect, lanceolate, acuminate, 2–5 cm long, not sheathing, with a prominent or obscure pale and semi-translucent border, margins denticulate or coarsely and shortly glandular-hairy. *Inflorescences* lax to semi-dense, (3–)7–18-flowered; rachis (2–)3–7 cm long; floral bracts lanceolate, acuminate,
9–18 by 1–3 mm, shorter than the pedicel plus the ovary, margins coarsely and shortly glandular-hairy. Flowers 10–12 mm across (excluding lip); mostly brown, orange-brown or red-orange, but also recorded as yellow or white with dark brown lip, once recorded as purple with white lip, spur or its tip sometimes green. Ovary (including pedicel) 19–27 mm long, with a long and narrow beak, hairy. Sepals rounded to subacute, 3-veined, margins mostly minutely denticulate; median sepal erect, suborbicular, (3–)3.5–4.2 by 3–4 mm; lateral sepals reflexed, very obliquely ovate, 5.5–7 by 3–4.8 mm. Petals erect, forming a hood with the median sepal, triangular-oblong, subacute, veins not prominent, (3–)4–4.2 by 1.7–1.8 mm, basally strongly united with the lateral sepals and the lip, margins mostly minutely denticulate. Lip 8–14 mm long, deeply 3-lobed above a short united part, with a low collar in front of the spur entrance; midlobe linear to oblong, (7–)9–12 by 0.8–1.2 mm; side-lobes linear to oblong, acute, (5–)9–12 by 0.5–0.8 mm; spur cylindrical, 17–23(–25) mm long, shorter than the ovary, thickened apically. Gynostemium 2.5–3 mm long, anther canals 2–3 mm long, straight or slightly curved upwards, auricles prominent, nearly as high as the anther. Fruit elliptic-tusiform, about 22.3 mm long and 4.1 mm in diameter, with a long apical beak to 10.6 mm long.

Thailand.— NORTHERN: Mae Hong Son [Pai, Srisanga & Puff 1054 (QBG)]; Chiang Mai [Chom Tong District, Garrett 742 (BKF, K); Ob Luang, Pumicong 378 (QBG)]; idem., Sørensen et al. 5223 (C); Mae Chaem, Seidenfaden & Smitinand 9568 (C [s]); NORTH-EASTERN: Sakon Nakhon [Phu Phan National Park, Thammawon 93 (KKU [s]); idem., Worachat 272 (KKU [s]); Nam Pung Dam, Triboun 1283 (l) (BK [s]); Mukdahan [Huai Huat National Park, Pooma et al. 2548 (BKF, L); Phu Pha Tub, Triboun 1374 (l) (KKU [s])]; EASTERN: Amnat Charoen [Chanuman District, Matthapha 112 (KKU)]; Si Sa Ket [Kantaralak District, Maxwell 76-509 (AAU, BK, L)]; Ubong Ratchathani [Pha Taem National Park, Boonjaras 303 (BCU); Khong Chiam, Grejmans 109 (BKF, ScCMU, ScCMU [s]); idem., Maxwell 01-411 (ScCMU, ScCMU [s], L); idem., Pooma et al. 2331 (L); Ban Ba Hai, Niyomtham 1237 (BKF)]; SOUTH-WESTERN: Ratchaburi [Marcan 1789 (BM, C, K); Kerr 0169 (BK, C [s], K); illegible 1789 (C)]; SOUTH-EASTERN: Chanthaburi [Khao Phra Bat, Larsen et al. 32119 (AAU, C [s]) [21 collections seen], 2 of them uncertain].

Distribution.— Myanmar, Indochina and S China (Sichuan and Yunnan).

Ecology.— Found in open places in deciduous or evergreen forest, also in pine forest and open sandy savanna; 50–1120 m altitude. Flowering: July–Sept.–Oct.

Conservation.— Widespread but scattered in the northern half of Thailand, but much less common than the similar Habenaria rostellifera. IUCN red list category ‘Least Concern’ (IUCN, 2001).

Illustrations.— Seidenf., Dansk Bot. Ark. 31(3): fig. 67a–c. 1977; present paper: fig. 14a–c.

Notes.— The species very much resembles Habenaria rostellifera (similar habit, foliage and general flower shape) but differs in the lack of the prominent pustulate tongue at the lip base. Furthermore, its anther canals are only gently upwards-curved (and not abruptly upwards-angled as in H. rostellifera). The two species very much resemble each other in the fruiting stage because of their long-beaked ovaries. In herbaria H. rostrata
has sometimes been mixed up with *H. acuifera* but can be distinguished by the long lip side-lobes and the long beak of the ovary.

**Figure 14. Habenaria rostrata** Wall. ex Lindl.: a. plant; b. flower; c. gynostemium. b.–c. from the type specimen. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.


Terrestrial, deciduous, glabrous except for the bract margins. **Stems** 36–43 cm
tall. *Cataphylls* 1–2, tubular, sheathing, enveloping the stem to 3 cm high. *Leaves* 4–5, spreading, cauline and scattered in the lower stem half, narrowly oblong-elliptic, acute, mucronate, 7–13 by 1–2 cm, with a prominent pale semi-translucent border, margins entire. *Bract-like leaves* to 7, spreading or erect, narrowly lanceolate, acuminate, 1.8–3.6 cm long, not or only very slightly sheathing at the base, with a prominent pale semi-translucent border, margins with short stiff hairs. *Inflorescences* dense or subdense, 8–many-flowered; rachis 5–7 cm long; floral bracts narrowly lanceolate, acuminate, 8–16 by 1–2 mm, shorter than the pedicel plus the ovary, margins shortly glandular-hairy or with stiff coarse hairs. *Flowers* to 18 mm across; median sepal, petals and lip white, lateral sepals recurved, obliquely ovate, 5–5.9 by 3.5–5 mm. *Petals* erect, oblong, broadly obtuse or subacute, 4–4.5 by 1.2–2 mm, margins papillose. *Lip* to 14 mm long, deeply 3-lobed above an undivided base of 3–4 mm, with a low forward stretching concave tongue ca 2 mm long in front of the spur entrance, lobes linear; midlobe 9–10.3 by ca 0.8 mm; side-lobes similar but slightly narrower; spur cylindric, 21–25 mm long, longer than the pedicel plus the ovary, thickenend in its apical third. *Gynostemium* ca 2.8 mm long, anther canals ca 2 mm long, straight, projecting forwards, auricles small.


**Distribution.** — Vietnam.

**Ecology.** — The Thai specimen known was found on grassy ground; 50 m altitude. Flowering: Aug.

**Conservation.** — IUCN red list category ‘Data Deficient’ (IUCN, 2001).

**Illustrations.** — Seidenf., Dansk Bot. Ark. 31(3): fig. 68a–c. 1977.

**Notes.** — This species is apparently known from a single collection in Thailand. It is similar to *Habenaria rostrata* but differs in the lip spur which is much longer than the ovary and in the shape of the transversal structure on the lip base in front of the spur entrance which is developed as an obscure collar in *H. rostrata* but as a low forward stretching concave tongue ca 2 mm long in *H. erostrata*.


Epilithic, deciduous. *Stems* 10–36 cm tall, with a mixture of short glandular hairs and elongate papillae. *Cataphylls* 2–3, tubular, sheathing, enveloping the stem base to 4 cm, glabrous, uppermost with a spreading blade to 1 by 0.7 cm. *Leaves* (2–)3–5, spreading, cauline, in a cluster well above the ground, oblanceolate-elliptic, subacute, mucronate, (3–)8–14 by 1.3–2(–3) cm, glabrous, margins often shortly glandular-hairy. *Bract-like leaves* 1–3, erect or spreading, lanceolate, acute or acuminate, 1.3–2.8 cm long, not sheathing, margins elongate-papillose or shortly glandular-hairy. *Inflorescences* lax, (4–)6–10-flowered; rachis 4–14(–21) cm long, shortly hairy; floral bracts lanceolate,
acuminate, 9–19 by 2.8–4(–5.5) mm, shorter than the pedicel plus the ovary, glabrous, margins elongate-papillose to shortly glandular-hairy. *Flowers* to 17 mm across; white or whitish yellow with green lateral sepals and lip, gynostemium white. *Ovary* (including pedicel) 15–22 mm long. *Sepals* subacute, 3-veined; median sepal erect, suborbicular, 6.5–9 by ca 4 mm, margins and ribs sometimes papillose; lateral sepals reflexed, ovate, 6–7 by 3.8–4.7 mm. *Petals* erect, cohering with the median sepal, broadly ovate, subacute, 2- or 3-veined, 6–8 by 4–6 mm. *Lip* 8–11 mm long, deeply 3-lobed to the base; midlobe recurved below the flower, linear to oblong, 7–10 by 0.8–1.5 mm; side-lobes pointing upwards, linear to oblong, 12–15 by 0.8–1 mm; spur cylindric, 20–30 mm long. *Gynostemium* 2.5–4 mm long, anther canals ca 2 mm long, straight, stigmas much shorter than the anther canals.

**Thailand.**— **NORTHERN:** Mae Hong Son [*Thaithong* s.n. (BCU [s])]; Chiang Mai [Doi Chiang Dao, *Khartchay* 981 (BKF, C [s]); idem., *Smitinand & Sleumer* 1031 (C [s], L)]; idem., *Sukathan* 3574 (QBG, QBG [s]); *Watthana* 2438 (QBG)]; Chiang Rai [Doi Tung, *Pooma* s.n. (BKF [s]); idem., *Maxwell* 06–481 (SeCMU, SeCMU [s]); Nan [Tham Sakoen National Park, *Watthana* 2113 (SeCMU, QBG, QBG [s], SING)]; Tak [Umpang, *Sukathan* 3500 (QBG [s]); idem., *Worachat* 52 (fructing) (KKU [s]); SOUTH-WESTERN: Kanchanaburi [Thong Pha Phum, *Kurzweil* 2480 (BKF); Three Pagoda Pass, *Kurzweil* 2485 (BKF); Khao Buing, *Phenglai et al.* 2981 (BKF, C, C [s]) [14 collections seen].

**Distribution.**— Myanmar.

**Ecology.**— Usually found in crevasses in limestone on exposed rocks or in evergreen or deciduous forest with bamboo; 740–1800 m altitude. Flowering: June–Sept.

**Conservation.**— This species is known from 14 collections made in scattered localities in the north and south-west, quite a few of which are situated in national parks. It is not a common species as its occurrence is limited by the presence of suitable sites, but the rocky habitat on cliffs and mountain tops is generally not very likely to become degraded. IUCN red list category ‘Least Concern’ (IUCN, 2001).

**Illustrations.**— Seidenf., Dansk Bot. Ark. 31(3): fig. 69a–d. 1977; present paper: fig. 15a–d.

**Notes.**— *Habenaria vidua* is unlike any other of the Thai habenarias with its unusual habitat on limestone rocks, the characteristic lip shape with the midlobe reflexed under the flower and the lip side-lobes sticking up, and the straight elongate anther canals.

A rachis length of 10–15 cm was given as a key character by Seidenfaden (1977) which is inaccurate as the rachis is most commonly shorter than this.

Figure 15. *Habenaria vidua* E.C. Parish & Rehb.f.: a. plant; b. flower; c. petal; d. gynostemium. All from one of the type specimens. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
Terrestrial, deciduous, glabrous except for the bract margins. Stems (24–)38–68 cm tall. Cataphylls 2–3, tubular, sheathing, enveloping the stem base to 7 cm high, upper with a blade to 1.5 by 1 cm. Leaves (2–)3–5(–6), spreading, cauline and in a cluster in the basal third of the stem, oblong-ovate to ovate-elliptic, acute, mucronate, (9–)15–24 by (1.9–)2.5–4(–5.7) cm, shortly petiolate, with an obscure pale semi-translucent border, margins often papillose. Bract-like leaves 7–15, erect, narrowly lanceolate, acuminate, 0.8–3.1(–6) cm long, not or very shortly sheathing at the base, often with a pale semi-translucent border, margins shortly glandular-hairy. Inflorescences lax, many-flowered; rachis (3–)9–23 cm long, sometimes with scattered papillae; floral bracts narrowly lanceolate, acuminate, 6.5–11(–15) by 2–3.9 mm, margins shortly glandular-hairy. Flowers 7–13 mm across; pale green. Ovary (including pedicel) 12–21 mm long. Sepals rounded to subacute; median sepal erect, ovate-lanceolate to broadly elliptic, concave, (2.8–)4.3–5 by 2.2–3(–4.2) mm; lateral sepals reflexed, slightly obliquely ovate, (3–)3.5–5 by 1.6–1.8(–2) mm. Petals erect, forming a hood together with the median sepal, oblong-elliptic, obtuse, 3–4(–5) by 1–2.3 mm. Lip 4–11 by ca 4 mm, deeply 3-lobed to 1–2 mm from the base; midlobe oblong to lorate, 3–5(–6.5) by 1–1.5 mm; side-lobes linear, 4–10.5 by 0.3–0.9 mm, deflexed; spur cylindrical, (15–)17–25 mm long, longer than the pedicel plus the ovary. Gynostemium 2–3 mm long, anther canals short, stigmas ca 1 mm long, central rostellum lobe with a small conical callus at the base behind the spur entrance, lateral rostellum lobes short and broad. Fruit elliptic-fusiform, 13.5–14.7 mm long, 3.1–4.6 mm in diameter, with a short apical beak up to 2.6 mm long.

Thailand.— NORTHERN: Chiang Mai [Doi Chiang Dao, Bunchuai 946 (BKF); idem., Maxwell 89-1309 (CMU); idem., Maxwell 95-860 (BKF, ScCMU, ScCMU [s]); Doi Suthep, Thai-Danish Botanical Studies 4980 (C [s]; idem., Thai-Danish Botanical Studies 4993 (C [s]; idem., Dixen s.n. (AAU); idem., Maxwell 89-1076 (CMU); idem., Sørensen et al. 4980 (C); idem., Sørensen et al. 4993 (BKF, C, L); Mae Rim, Indhamusika 040 (QBG [s]); idem., Watthana 2454 (QBG [s]); Chiang Rai [Doi Hang, Garrett 206 (BKF, C, C [s], K)]; Lampang [Pakbok, Pumicong 503 (QBG, QBG [s]); Sukhothai [Khao Luang Ram Kam Heng, Sukthathan s.n. (QBG [s] 29398); Kamphaeng Phet [Klong Laan, Watthana 1506 (QBG, QBG [s]); NORTH-EASTERN: Loei [Thaihtong 1426 (BCU [s]); EASTERN: Chaiyaphum [Phu Khio, Seidenfaden & Smitinand 8179 (C [s]); SOUTH-WESTERN: Kanchanaburi [Wang Po, Kasem 650 (BK); Huai Bankao, v. Beusekom et al. 3530 (BKF, C, C [s], L)]; CENTRAL: Saraburi [Ban Nong Bua, Kerr 0648 (BK, C, K); idem., Pat 1139 (BK, C, K); idem., Winit s.n. (BKF SN077028)]; SOUTH-EASTERN: Chon Buri [Siracha District, Maxwell 75-1059 (AAU, BK, L); Khao Khiew, Thorut 196 (BCU, BCU [s]); WITHOUT LOCALITY: illegible s.n. (K H2001/02483-52); Nanakorn et al. 9608 (QBG) [26 collections seen].

Distribution.— Pakistan and India to S China (Yunnan).

Ecology.— Found in various forest types, including evergreen, deciduous forest with teak, mixed deciduous forest and bamboo forest, and also collected in thorn-scrub; 100–1050 m altitude. Reported over granite and shale. Flowering: (Aug.–)Sept.–Dec.

Conservation.— Widespread but scattered throughout Thailand, but apparently absent from the extreme north-eastern and eastern parts and from the peninsula. IUCN red list category ‘Least Concern’ (IUCN, 2001).
Figure 16. Habenaria furcifera Lindl.: a. plant; b. flower; c. gynostemium. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
Illustrations.— Seidenf., Dansk Bot. Ark. 31(3): fig. 72a–c. 1977; present paper: fig. 16a–c.

Notes.— Important diagnostic features of the species are the robust habit with several large cauline leaves, the lax and usually fairly long inflorescence, the green flowers with equally 3-lobed lips with deflexed side-lobes and the thin lip spurs which are longer than the ovaries.


Terrestrial, deciduous, glabrous. Stems (7–)13–23(–30) cm tall. Cataphylls 1–3, tubular, sheathing, uppermost with a blade to 0.5 by 0.3 cm. Leaves 3–5, erect or suberect, both radical and cauline but clustered near the base of the stem, grass-like, narrowly linear-oblong, acute, mucronate, 2–8(–11) by 0.15–0.4 cm, with entire margins, sometimes rolled-in. Bract-like leaves 2–7(–9), erect, lanceolate, acuminate, (0.3–)0.6–1.4(–2) cm long, sheathing or not, margins entire. Inflorescences lax, (3–)6–10-flowered; rachis 2–10 cm long; floral bracts broadly lanceolate, acuminate, 3–6(–8) by 2–3 mm, much shorter than the pedicel plus the ovary, margins entire. Flowers 10–15 mm across (excluding the lip side-lobes); green or greenish yellow, lip sometimes brownish yellow, anther recorded as white; once reported as scented. Ovary (including pedicel) (7–)10–11.5 mm long. Sepals rounded to subacute, 3-veined; median sepal erect, elliptic, (3–)3.6–6 by 2.2–4.5 mm; lateral sepals spreading, elongate-ovate, 3.5–7 by 1.7–2.2(–3) mm, united at the base with the petals and the lip. Petals suberect, cohering with the median sepal, slender triangular, subacute, 1-veined, 3.8–8 by 1–1.8 mm, longer than the sepals. Lip 6–9 mm long, deeply 3-lobed from the base, all lobes filiform, 0.5–0.8 mm wide; midlobe 4–9 mm long; side-lobes 11–35 mm long, much longer than the midlobe; spur cylindrical, 6–15 mm long, sometimes thickened in the apical half. Gynostemium ca 2 mm long, anther canals ca 0.5 mm long, stigmas 1.5–2.5 mm long.

Thailand.— NORTHERN: Chiang Rai [Khunkorn Waterfall Forest Park, Boonkerd et al. KK 790 (BCU [s])]; NORTH-EASTERN: Loei [Dee 322 (BKF, C, C [s], K, P); Smitinand 1865 (BKF, C)]; Sakon Nakhon [Phu Phan National Park, Suddee 820 (BKF [s]); idem., Thammatawon 88 (KKU [s])]; EASTERN: Si Sa Ket [Kantaralak District, Maxwell 16/6-519 (AAU, BK, L)]; Ubon Ratchathani [Pho Sai District, Suddee 790 (BKF [s])]; SOUTHEASTERN: Prachin Buri [Chermisirawathana 1806 (BK)], Thaithong 753 (BCU [s]); Chanthaburi [Makham, Smitinand 3510 (BKF, C)]; Trat [Larsen et al. 32411 (AAU, BKF, C, C [s], K, L, P, SING)]; WITHOUT LOCALITY: Comber 1/06 (K), Maxwell 94-975 (SeCMU [s]) [13 collections seen].

Distribution.— NE India and Indochina.
Ecology.— In wet sandy and rocky soil in open dipterocarp forest, in open pine forest and savanna; from sea level to about 1300 m altitude. Flowering: July–Sept.(–Nov.).

Conservation.— Thirteen collections were examined from the northern, north-eastern, eastern and south-eastern parts of the country, some of them situated in national parks and forest parks. This species is a small herb and is probably frequently overlooked. IUCN red list category "Least Concern" (IUCN, 2001).

Figure 17. Habenaria khasiana Hook. f.: a. plant; b. flower; c. median sepal; d. petal; e. lateral sepal; f. gynostemium. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
Illustrations.— Seidenf. & Smitinand, Orchids Thailand: fig. 22. 1959; Seidenf., Dansk Bot. Ark. 31(3): fig. 73a–f. 1977; present paper: fig. 17a–f.

Notes.— This species is very distinct with its grass-like leaves and the small green flowers with long thread-like lip side-lobes.


Terrestrial, deciduous, glabrous. Stems (23–)40–45 cm tall. Cataphylls 1–2, tubular, sheathing, enveloping the stem to 3 cm high; uppermost sometimes with a blade to 1 by 0.4 cm. Leaves 2–4, spreading, basal, narrowly lanceolate, acute or subacute, (5.5–)7–11 by 0.5–0.85 cm, with or without a pale semi-translucent border. Bract-like leaves 1–7, erect, narrowly lanceolate, acuminate, 0.7–4.5 cm long, not sheathing, sometimes with obscure pale and semi-translucent border, margins entire or serrate. Inflorescences lax, ca 12–many-flowered; rachis 8.5–24 cm long; floral bracts lanceolate, acuminate, (3.5–)5–8 by 1–2 mm, much shorter than the pedicel plus the ovary, margins entire. Flowers 4.8–7 mm across; green or yellow-green. Ovary 4.2–7.7 mm long, distinct from the 1.5–3.5 mm long pedicel. Sepals subacute, 3-veined; median sepal erect, suborbicular, 2–3.5 by 1.6–2.5 mm; lateral sepals spreading, ovate to slightly obliquely ovate, 3–4.4 by (1.8–)2–3.5 mm. Petals erect, forming a hood with the median sepal, triangular to triangular-ovate, subacute or obtuse, 1-veined, 2–3.8 by 0.5–1.5 mm. Lip 4.5–9 mm long, 3-lobed from just above the base; midlobe oblong, sides curved down, 2.9–5 by 0.8–1 mm; side-lobes spreading, narrowly oblong, acute, 3.5–6 by 0.4–1.2 mm, slightly longer than the midlobe; spur cylindrical, 15–21 mm long. Gynostemium 1–1.5 mm long, anther reflexed, anther canals insignificant, in typical specimens of the examined Thai material to 0.5 mm long, straight, stigmas to 2 mm long. Fruit with a short 3 mm long stalk, elliptic-fusiform, 12.8 mm long, 2.9 mm in diameter, apically not beaked. [this description does not include the doubtful specimen Sukasathan 3579].

Thailand.— ? NORTHERN: Chiang Mai [Doi Chiang Dao, Sukasathan 3579 (uncertain, see below) (QBG [s])]; NORTH-EASTERN: Sakon Nakhon [Phu Phan National Park, Auemporn 31/1999 (KKU [s]); idem., Thammatawon 89 (KKU [s])]; EASTERN: Chaiyaphum [Phu Khieo, Seidenfaden & Smitinand 8123 (C [s])]; Si Sa Ket [Khun Han, Maknoni 287 (QBG)]; SOUTH-EASTERN: Prachin Buri [Thaitinch 474 (BCU [s])]; WITHOUT LOCALITY: Thailand 1261 (BCU [s]) [7 collections seen, 1 of them uncertain].

Distribution.— India and Sri Lanka to S China (Guangxi).

Ecology.— Largely not known, usually growing terrestrially in damp areas, in one collection reported as common in rice fields. A doubtful specimen was found as a lithophyte on a limestone cliff. Flowering: July–Sept.

Conservation.— Only seven collections from scattered localities mainly in the north-east, east and south-east and one unknown locality have been seen. IUCN red list
category ‘Vulnerable’ based on geographic range and decline (B2a,b(iii); IUCN, 2001).

Illustrations.— Seidenf., Dansk Bot. Ark. 31(3): fig. 74a–g. 1977; present paper: figs. 18a–g, 19.

Notes.— This species also has narrow leaves and small green flowers but differs from Habenaria khasiana in the lip side-lobes which are oblong (as opposed to thread-like) and only slightly longer than the midlobe.

Figure 18. Habenaria viridiflora (Rottler ex Sw.) Lindl.: a. plant; b. d. flower; c. gynostemium; e. median sepal; f. lateral sepal; g. petal. d.–g. from an Indian plant. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
Seidenfaden (1977: 114) pointed out that his newly described *Habenaria tonkinensis* Seidenf. resembles *H. viridiflora* in a number of characters, and suggested that the two species have been confused in the past in a few cases (particularly in some collections from Indochina). The clearest distinguishing character between the two taxa is the shape of the petals which are triangular to triangular-ovate in *H. viridiflora* but oblong-linear in *H. tonkinensis*.

There appears to be variation in the length of the anther canals. While they are very short and insignificant in the Thai material examined in the present study (about 0.5 mm long), they appear to be more prominent in Indian material (see Wight, 1852).

The specimen *Suksathan 3579* (QBG [s]!), collected on a limestone cliff in Chiang Mai Province, is similar to *Habenaria viridiflora* in most vegetative and floral characters but differs by having somewhat wider leaves (to 1.1 cm wide; as opposed to 0.5–0.85 cm wide in typical *H. viridiflora*); comparatively long floral bracts (longer than the pedicel plus the ovary; as opposed to much shorter); an ovary which is not distinct from the pedicel (as opposed to distinct from it); slightly larger flowers (sepals and petals 3.5–5.9 mm long, as opposed to 2–4.4 mm); a shorter spur (9–12.5 mm long, as opposed to 15–21 mm long); a longer gynostemium (2.1–2.3 mm long, as opposed to 1–1.5 mm long); and longer anther canals (0.6–0.8 mm long, as opposed to 0.5 mm) (however, the length of the anther canals of *H. viridiflora* generally seems to be the subject of variation as pointed out above). Also the lithophytic habitat of this specimen is unusual, as typical plants of *H. viridiflora* are terrestrial. The shorter stem and the fewer-flowered inflorescence of the
specimen could well be a consequence of its rocky habitat with its difficult nutrient and water supply. Most of the differences of the collection Suk sat han 3579 from the typical Thai specimens of *H. viridi fl ora* are not major and therefore it is here interpreted as an aberrant specimen of *H. viridi fl ora*, while realising that future work on more material may possibly show that it is distinct and should be separated into a new species.


Terrestrial, deciduous, glabrous except for the bract margins. Stems 13–15 cm tall. *Cataphylls* 2–3, tubular, sheathing, enveloping the stem below the leaves to 6 cm high. Leaves 2–4, cauline and scattered in the upper stem half, spreading, lanceolate-elliptic, acute, 2–5.5 by 0.7–1 cm. *Bract-like leaves* absent. Inflorescences lax, 4–5-flowered; rachis 1.6–3(–5) cm long, slightly denticulate; floral bracts lanceolate, acuminate, as long as or slightly longer than the ovary, 10–14 by 1.8–3(–4.5) mm, margins shortly glandular-hairy. Flowers 6.9–7.6 mm across; green. Ovary (including pedicel) 8–9 mm long. Sepals broadly lanceolate, acute; median sepal erect, hooded, 3.9–5 by ca 3 mm, with a crenate laminar median keel on the dorsal side; lateral sepals with pronounced mucros, 3.5–5 by 1.6–2 mm. Petals suberect, obliquely triangular, acute, 2.5–3.5 by ca 1 mm, with a minute lobe on the distal side. Lip 5–8 mm long, hastately 3-lobed, without any ornaments, all lobes linear-lanceolate and acute to acuminate; midlobe 3.2–6 mm long; side-lobes subulate, 1.5–3 mm long, much shorter than the midlobe; spur cylindric, stout, obtuse, 4–5 mm long, about half as long as the ovary. *Gynostemium* 2–2.7 mm long, anther canals ca 0.3 mm long, straight, stigmas very close (or united?).


**Distribution.—** Endemic.

**Ecology.—** Found in evergreen or mixed hill forest; one collection from 1070 m altitude. Flowering: Sept. and Oct.


**Illustrations.—** Seidenf., Opera Bot. 124: fig. 3a–f. 1995.

**Notes.—** *Habenaria hastata* is very distinct in its small plant size, the broad leaves, the few-flowered inflorescence, the mucronate spreading lateral sepals and the close (or merged?) stigmas (Seidenfaden, 1995: 13). The species is only known from the type collection and a second collection made recently in Nan Province (both in northern Thailand).

var. rumphi

Terrestrial, deciduous, glabrous except for the bract margins. **Stems** (15–)23–36(–48) cm tall. **Cataphylls** 1–2, tubular, sheathing, enveloping the stem to 5 cm high; uppermost sometimes with a blade to 1 cm long, acute, with a distinct pale semi-translucent border. **Leaves** 2–4, spreading, cauline and scattered in the lower stem half, linear or narrowly lanceolate-oblong, acute, mucronate, 5–12 by 0.4–1(–1.5) cm, with a pale semi-translucent border. **Bract-like leaves** 6–13, erect or spreading, lanceolate, acuminate, 1–5.5 cm long, not or only shortly sheathing, with an obscure or more rarely prominent pale semi-translucent border, margins minutely papillose-denticulate or shortly glandular-hairy. **Inflorescences** dense, 10–30-flowered; rachis 1.5–3.5(–4) cm long; floral bracts narrowly linear-lanceolate, elongate-acuminate, 10–25 by 1.5–2.2 mm, margins sometimes shortly glandular-hairy. **Flowers** 8–11 mm across; white, yellow or brown; one record from Loei Province reported as purple. **Ovary** (including pedicel) 9–16(–20) mm long. **Sepals** rounded, 3-veined; median sepal erect, elongate elliptic, 3–5 by 1.8–3.5 mm; lateral sepals reflexed backwards and upwards, slightly obliquely elliptic-ovate, 4–6(–7) by 2.8–3.5(–3.8) mm. **Petals** erect, forming a hood with the median sepal, triangular-oblong, obtuse, 3-veined, 3.3–5.5 by 0.9–2 mm. **Lip** 6–10 mm long, deeply 3-lobed from near the base, with a collar around the spur entrance; midlobe attenuate, 5–9 by 0.6–1.6 mm; side-lobes attenuate, 3–5.5 by 0.5–0.7 mm, shorter than the midlobe; spur cylindric, (4.3–)5–13 mm long, shorter than the ovary, thickened in the upper third. **Gynostemium** 2–2.5 mm long; anther canals short, lateral rostellum lobes more or less enlarged. **Fruit** sessile, elliptic-fusiform, 10.4–11.5 mm long, 2.4–3.6 mm in diameter, without an apical beak.

**Thailand.**—**NORTH-EASTERN**: Phetchabun [Thung Salaeng Luang National Park, Kerr 0946 (C, K)]; Loei [Phu Kradueng National Park, Chantaranothai et al. 90/93 (K, KKU); idem., Prayad 1079 (BK); idem., Phusomsaeng et al. 108 (BKF); idem., Santisuk 516 (BKF); idem., Smitinand et al. 6120 (BKF); idem., Charoenphol et al. 4809 (AAU, K); idem., Dee 140 (BKF, P); idem., Dee 320 (BKF, P); idem., Dee 385 (BKF, C [s], K); idem., Prayad 2085 (BK); idem., Sleumer 4760 (C, K, L); idem., Smitinand 6120 (C, K); idem., Phusomsaeng et al. 67 (C, BKF); idem., S. P. et al. 108 (C, C [s]); ? idem., ‘native collector’ 155 (P); ? idem., Seidenfaden & Smitinand 3140 (C [s])); **EASTERN**: Chaiyaphum [Thung Kra Mang, Larsen et al. 31613 (AAU, B, BKF, C [s], K, L); no exact locality, Kitichate 202 (BCU [s])]; Si Sa Ket [Maxwell 76-542 (AAU, BK, L)]; **SOUTH-WESTERN**: Phetchaburi [Marcan 2772 (C [s])]; **SOUTH-EASTERN**: Prachin Buri or Sa Kaeo [Umpai 653 (BK)]; Prachin Buri [Watana, Put 1915 (BK, C [s], K); no exact locality, Seidenfaden & Smitinand 9566 (C [s]); idem., Songkakul 32 (BKF [s]); idem., Thaithong 468 (BCU [s]); ? idem., Thaithong 132 (BCU); idem., Tiptabiankarn 2105 (Suan Luang [s])]; **PENINSULAR**: Krabi [Watana, Kerr 0223 (K)]; **WITHOUT LOCALITY**: **BCU** s.n. (BCU [s] 008923); Comber 1704 (K [s]); Larsen 4809 (C [s]); Thaithong 274 (BCU [s]); Tiptabiankarn 1195 (Suan Luang [s]); without collector (BCU [s]) [34 collections seen, 3 of them uncertain].

**Distribution.**—Widespread from Indochina through the whole of Malesia as far east as New Guinea and Queensland (Australia).

**Ecology.**—This is a rather common species in wet or marshy places in open grassy
ground and pine savanna; 50–1300 m altitude. Flowering: (July--)Aug.--Oct.(-Dec.).

Conservation.— Widespread but scattered throughout most of Thailand, though not recorded in the north. IUCN red list category ‘Least Concern’ (IUCN, 2001).

Figure 20. Habenaria rumphii (Brongn.) Lindl.: a. plant; b. e. flower; c. gynostemium; d. lower front part of gynostemium in side view; f. petal; g. floral bract. e.–g. from an Indonesian plant. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
Illustrations.— Seidenf., Dansk Bot. Ark. 31(3): fig. 75a–g. 1977; present paper: fig. 20a–g.

Notes.— Habenaria rumphii is very similar to H. acuifera but is easily distinguished by its anther with short anther canals. The species is also well-characterised by its short and dense inflorescences and the strongly reflexed lateral sepals.

Photographs apparently illustrating this species have been seen from Ubon Ratchathani (eastern Thailand) during the present study. Although no actual specimen from this province has been examined the occurrence of this species would be quite natural given its occurrence in the neighbouring province Si Sa Ket.

Only the typical variety is found in Thailand, while Habenaria rumphii var. meraukensis J.J.Sm. with purple flowers is known from New Guinea.


Terrestrial, deciduous, glabrous except for the bract margins. Stems (10–)13–25 cm tall. Cataphylls 1–2, tubular, sheathing, enveloping the lower 4 cm of the stem. Leaves 3–7, spreading, cauline and scattered in the lower or middle part of the stem, lanceolate-oblong, acute, 3–9 by 0.8–1.6 cm, with a distinct pale border. Bract-like leaves 2–5, lanceolate, acuminate, 1.4–3.5 cm long, minutely denticulate or ciliate on the margins, with a distinct semi-translucent pale border. Inflorescences dense or semi-dense, 2–20-flowered; rachis 1.6–6 cm long; floral bracts ovate-lanceolate, acuminate, 9–15(–26) by 2.5–4 mm, minutely denticulate on the margins. Flowers 9–13 mm across; orange-yellow or pale yellow, gynostemium cream, pollinia light brown. Ovary (including pedicel) (10–)12–15 mm long, smooth. Sepals obtuse to subacute, 3-veined; median sepal erect, suborbicular to broadly elliptic, 5.2–7 by 4.5–5 mm; lateral sepals narrowly ovate, basally extensively united with the lip claw and the petals, 6.9–10 by 2.5–4 mm. Petals erect, falcately triangular, curved towards the median sepal and forming a hood with it, obtuse, 2-veined, 4.7–7 by 3.5–5 mm. Lip 9–16 mm long, deeply 3-lobed to 3–5 mm from the base, lobes linear to oblong; midlobe (6.5–)6.7–10(–13.8) by (1.5–)2–2.5 mm, margins curved downwards; side-lobes 6–8.3 by 1–1.7 mm; spur cylindrical and apically clavate, 7–11 mm long, somewhat geniculate in the middle. Gynostemium 2.5–3 mm long, anther canals ca 0.6 mm long, stigmas ca 2.5 mm long.
Thailand. — NORTHERN: Chiang Mai [Doi Suthep, *Kerr* 125 (holotype of *Habenaria aurantiaca* K); idem., *Kerr* s.n. (K H2006/104/8–70); idem., Seidenfaden & Smitinand 3016 (C [s]); Mae Rim, Watthana 1357 (QBG [s]); no exact locality, Smitinand 7583 (BKF)]; Lampang [Chaehom, *Panatkool* 412 (SeCMU, SeCMU [s])]; Phrae [Mae Tang, *Indhamusika* 36 (QBG [s]); no exact locality, *Winit* 1431 (BKF, K)]; WITHOUT LOCALITY: *Thaithong* 1276 (BCU [s]) [9 collections seen].

Distribution.— Pakistan and India to S China (Yunnan).

Ecology.— Found in degraded deciduous forest and also in old rice field bunds; 190–1100 m altitude. Reported over sandstone. Flowering: Sept.–Oct.

Conservation.— Nine collections in the north have been seen, a few of which are situated inside national parks giving the species a certain amount of protection. IUCN red list category ‘Near Threatened’ (IUCN, 2001).

Illustrations.— Seidenf. & Smitinand, Orchids Thailand: fig. 19a–c. 1959 [as *Habenaria aurantiaca*]; Seidenf., Dansk Bot. Ark. 31(3): fig. 78a–e. 1977.

Notes.— This is an uncommon species with dense or semi-dense inflorescences of yellow to orange flowers with equally 3-lobed lips. The variation in the arrangement of the leaves is considerable ranging from subradical to scattered in the same population (see Seidenfaden, 1977: 125).


Terrestrial, deciduous, apparently glabrous. Stems 25–30 cm tall. Cataphylls few, tubular, sheathing, upper on our Thai specimen with a small blade. Leaves 4–7, spreading, cauline and scattered all along the stem, lanceolate-oblong, acute, to 11.5 by 1.5 cm, becoming shorter towards the upper part of the stem. Bract-like leaves absent. Inflorescences dense, many-flowered; rachis ca 9.5 cm long; floral bracts narrowly ovate-lanceolate, acuminate, the lower slightly longer than the flowers, to 25 mm long. Flowers ca 15 mm across; white. Ovary (including pedicel) ca 12 mm long, smooth. Sepals obtuse to subacute, 3-veined; median sepal erect, suborbicular to broadly elliptic, 7–7.8 by ca 4 mm; lateral sepals narrowly ovate, basally extensively united with the lip and the petals, 6.4–8 by 3.3–4 mm. Petals erect, falcately triangular, cohering with the median sepal, obtuse, 1-veined, ca 6 by 3.9 mm. Lip 10–16 mm long, deeply 3-lobed to ca 4.5 mm from the base, lobes linear to oblong; midlobe 5.5–10 by 1.6–1.8 mm, margins curved down; side-lobes 5.8–6.3 by ca 0.5 mm; spur cylindric and apically clavate, 7.1–8 mm long, slightly geniculate in the middle. Gynostemium 2.7–2.8 mm long, anther canals ca 0.5 mm long, stigmas ca 2.5 mm long.

Thailand. — NORTHERN: Chiang Mai [Omkoi, *Seidenfaden & Smitinand* 8152 (C [s])] [1 collection seen].

Distribution.— Myanmar.

Ecology.— The single Thai collection was made in an old rice field at 800 m altitude. The date of flowering is not known.
Conservation.— A single Thai record of this poorly understood species from Myanmar is known. No comment on the size of the population in Omkoi was made by Seidenfaden (1977), and consequently it is not possible to assess the status of the species in Thailand properly. However, it was listed in a book on threatened plants of Thailand (Suddee, 2005: 129). IUCN red list category ‘Data Deficient’ (IUCN, 2001).

Illustrations.— Seidenf., Dansk Bot. Ark. 31 (3): fig. 77a–e. 1977.

Notes.— As pointed out by Seidenfaden (1977) the flowers of Habenaria avana differ from those of H. marginata merely in their colouring (white in H. avana, orange-yellow in H. marginata). There appear to be differences in the leaf arrangement, as the leaves of H. marginata seem to be mostly scattered in the middle or basal part of the stem, while the leaves of the single Thai specimen of H. avana are scattered all along it. However, the differences are only slight and the variation within H. marginata is extensive (see above). Future studies will have to show whether the distinction between the two species can indeed be upheld.


Terrestrial, deciduous, almost entirely glabrous but bract margins sometimes hairy. Stems 29–55 cm tall. Cataphylls 2–3, tubular, sheathing, enveloping the stem base to 2.5 cm high, uppermost often with a small blade. Leaves 4–5, cauline and scattered or clustered in the lower part of the stem, elliptic-lanceolate, acute to subacute, mucronate, 5–12 by 1.2–2.3 cm, with papillose margins. Bract-like leaves 8–10, lanceolate or lanceolate-elliptic, acuminate, 2.2–6 cm long, smooth or papillose on the surface, margins denticulate or papillose. Inflorescences lax or semi-dense, few-flowered; rachis 4–10 cm long; floral bracts lanceolate, acute or acuminate, 20–25 by 3–6 mm, slightly longer than the pedicel plus the ovary, margins elongate-papillose to shortly glandular-hairy. Flowers to 19 mm across; white. Ovary (including pedicel) 15–22 mm long, papillose, curved, beak narrow. Sepals elliptic-ovate, subacute to obtuse, 3-veined; median sepal erect, 6.5–10.5 by 3.5–5.5 mm; lateral sepals obliquely spreading, 6.8–11 by 3–4.6 mm, their bases united with the petals and the lip. Petals oblong or elliptic-lanceolate, subacute or obtuse, 1- or 3-veined, 7–11.5 by 1.5–2 mm. Lip 8–16.5 by 2.5–3 mm, unlobed, oblong-spastulate, obtuse, normally widest in its upper part, with involute margins, with a prominent erect tongue in front of the entrance of the spur, this tongue with obscure rounded outgrowths on the sides (but not with prominent teeth!), the laminate flange in the middle of this tongue very prominent and occupying most of its length, apex of the tongue entire or somewhat emarginate; spur cylindric, (28–30–38–47) mm long, slightly clavate, with obtuse apex. Gynostemium 3–4 mm long, anther with a prominent terminal connective process, anther canals 3–5 mm long, curved or angled upwards, stigmas 4–5 mm long, curved upwards.
Thailand.— NORTHERN: Chiang Mai [Omkoi, *Punicong* 386 (QBG, QBG [s], SING); idem., *Suksathan* 2898 (QBG, C [s]); ? Sukhothai [Srichalieng, *Kasem* 260 (BK)]; NORTH-EASTERN: Kalasin [Phu Sing, *Sakol* 3490 (BK)]; EASTERN: Ubon Ratchathani [Pho Sai District, *Suddee* 801 (BFK [s])]; SOUTH EASTERN: unspecified: *Thaitrong* 504 (BCU, BCU [s]); Prachin Buri [Kasem 475 (BK); ? Ubolcholakhat e s.n. (BCU [s])]; WITHOUT LOCALITY: *Thaitrong* 772 (BCU [s]); *Tiptabiankarn* 6856 (Suan Luang [s]) [10 collections seen, 2 of them uncertain].

Distribution.— Myanmar and Indochina.

Ecology.— Found in dry deciduous dipterocarp forest or open pine-oak forest, once found in a boggy area in a forest clearing; 280–1025 m altitude. Sometimes reported on lateritic soil. Flowering: Aug.–Nov.

Conservation.— Ten collections in the north, north-east, east and south-east have been seen. As suggested below, the species was probably sometimes mistaken for *Habenaria hosseusii*. IUCN red list category ‘Data Deficient’ (IUCN, 2001).


Notes.— *Habenaria mandersii*, *H. dentirostrata* and *H. hosseusii* form a distinct group, well-characterised by their entire and oblong-lorate lip, which is widest in its upper part, and the tongue of the lip which is positioned in front of the spur entrance. A comparison of the floral characters of the three species was given by Kurzweil (2008).

*Habenaria mandersii* was only recently recorded in Thailand (Kurzweil, 2008) but is known in both Myanmar and Indochina. It is here assumed that it was in the past mistaken for a short-spurred form of *H. hosseusii* although it is quite distinct from it in fine details of the tongue in front of the spur entrance. In *H. mandersii* the lateral teeth of this tongue are reduced to obscure round bulges, and in addition this species exhibits a large laminate flange on the tongue (which is short in *H. hosseusii*).

### 36. Habenaria dentirostrata


Terrestrial, deciduous, glabrous except for the bract margins and midribs. *Stems* 35–50 cm tall, terete below and several-angled above. *Leaves* 3–8, caulescent and scattered or clustered in the lower stem portion, lanceolate-elliptic, acute or subacute, mucronate, 5.2–7 by 1–1.4 cm. *Bract-like leaves* 4–8, lanceolate, acuminate, 2.8–3 cm long, elongate-papillose or glandular-hairy on the margins. *Inflorescences* lax to semi-dense, to 11-flowered; rachis several-angled, 7–10 cm long; floral bracts lanceolate, acuminate, 25–30 by 4–4.5 mm, longer than the pedicel plus the ovary, elongate-papillose to shortly glandular-hairy on the midrib and on the margins. *Flowers* 21–23.5 mm across; colour not known. *Ovary* (including pedicel) ca 23 mm long, ribbed, minutely papillose, with narrow beak of ca 7 mm. *Sepals* ovate-lanceolate, subacute, 3-veined; median sepal apparently
reflexed, 9.7–11.3 by ca 5.5 mm; lateral sepals spreading, oblique, 10–11.3 by 4–5.5 mm, basally united with the petals and the lip. Petals lorate, obtuse or subacute, 3-veined, 11–12.5 by 2.5–2.8 mm. Lip 18–20 by 2.6–3 mm, entire, obtuse, oblong-spathulate, widest in its upper part, edges rolled inwards (at least in spirit-preserved material), with a ca 3 mm long tongue in front of the spur entrance, this tongue with triangular teeth on the sides, the longitudinal flange in the middle of the tongue a minute round bulge, apex of tongue bilobed; spur cylindric, to 70 mm long, slightly clavate, apex obtuse. Gynostemium ca 4.5 mm long, anther canals 6–7 mm long, curved or geniculately angled upwards, auricles raised and ca 1 mm in diameter, stigmatic processes about 6 mm long, bent upwards.

? Thailand.— Bought at a market in Bangkok [Thaithong 768 (BCU [s])] [1 collection with uncertain origin seen].

Distribution.— Myanmar and Indochina.


Conservation.— Origin unknown. IUCN red list category ‘Data Deficient’ (IUCN, 2001).


Notes.— The occurrence of this species in Thailand is very uncertain. A plant was bought at the Weekend Market in Bangkok (Thaithong 768, BCU [s]) but it is not known whether it actually came from somewhere in Thailand or was brought over the borders from Myanmar or Laos.

Habenaria dentirostrata is very similar to H. mandersii and H. hosseusii. It shares with H. hosseusii the prominent lateral teeth of the tongue of the lip base (which are absent in H. mandersii), differing merely in the retuse or bilobulate apex of the tongue. Although H. dentirostrata was treated as distinct by Seidenfaden (1977) it is possible that a future study of the H. hosseusii group may show that it should be treated as conspecific with H. hosseusii.


Terrestrial, deciduous, glabrous except for the bract margins. Stems (27–)32–56(–74) cm tall. Cataphylls 2–4, tubular, sheathing, enveloping the stem base to 7 cm high; uppermost often with a blade to 2.6 by 1.6 cm. Leaves 3–9, spreading, caudine and scattered in the lower stem portion, lanceolate-elliptic, acute, mucronate, (3–)6–16 by (0.8–)1–2.2(–2.8) cm, entire or elongate-papillose on the margins. Bract-like leaves 3–10, suberect to spreading, lanceolate-elliptic, acuminate, occasionally dry at the flowering time (?), (2.2–)2.5–5(–8) cm long, not or scarcely sheathing at the base, shortly glandular-
Figure 21. Habenaria hosseusii Schltr.: a. plant; b. flower; c. section through gynostemium; d. tongue at the lip base. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.
hairy on the margins. Inflorescences lax, (4–)8–15-flowered; rachis (3–)4–18 cm long; floral bracts lanceolate, acuminate, (12–)19–30–(40) by 3–5(–6) mm, shorter or longer than the pedicel plus the ovary, shortly glandular-hairy on the margins. Flowers 15–25 mm across; white, distal parts of tepals and spur sometimes greenish, gynostemium white, anther yellow. Ovary (including pedicel) 21–26–(30) mm long, often papillose, pedicel sometimes pronounced, 1–2 mm long. Sepals oblong-elliptic, subacute or obtuse, 3–5-veined from the base; median sepal erect, 8.5–12(–14) by 1–2 mm long. Lip 10–17–(24) by 1–2–(3.5) mm, entire, oblong-spathulate, widest in its upper part, with a 2–3 mm long tongue in front of the spur entrance, laminate flange in the middle of the raised tongue small, the sides of this tongue with two small teeth, apex of tongue obtuse or mucronate; spur cylindrical, (48–)60–100 mm long, thickened in the distal quarter. Gynostemium 3–4 mm long; anther canals and stigmatic processes 3–5 mm long.

Thailand.— NORTHERN: Mae Hong Son [Mae Sariang, Larsen et al. 2226 (AAU, BKF)]; idem., Larsen et al. 2321 (AAU, BKF, L, P); idem., Prayad 310 (BK); Chiang Mai [Doy Suthep, Maxwell 88-1071 (BKF, CMU); idem., Seidenfaden & Smitinand 2759 (C [s]); Mae Rim, Srisanga 2182 (QBG); Ob Luang, Maxwell 96-1316 (SeCMU, SeCMU [s]); idem., Seidenfaden & Smitinand 3008 (C [s]); idem., Sorensen et al. 5256 (BKF, C); Doy Inthanon National Park, Phengklai et al. 6563 (BKF); Mek Hia, Kerr 196 (K); Mae Soi Valley, Maxwell 91-805 (SeCMU, SeCMU [s], P); Lamphun [Doy Khun Tan National Park, Maxwell 94-945 (SeCMU, SeCMU [s], L)]; Tak [Wang Chao, Hosseus 77 (lectotype K, isolecotypes BM, P); Umphang, Keratikorokt 388 (QBG [s]); Mussoe, Seidenfaden & Smitinand 7906 (C [s]); no exact locality, Worachat 47 (KKU [s])]; Kamphaeng Phet [Khao Hua Mot, Kerr 473 (BK, C, K, L)]; NORTHERN-EASTERN: Phetchabun [Thung Salaeng Luang National Park, Kerr 0944 (BK, C, K)]; Sakon Nakhon [Phu Phan National Park, Auemporn 15/1999 (KKU [s]); idem., KKU 878 (KKU [s])]; EASTERN: Buri Ram [Ban Kruat, Murata et al. T 37485 (BKF); no exact locality, Murata et al. T 37399 (BKF, L)]; SOUTH-WESTERN: Uthai Thani [Phengklai 3992 (BKF)]; Phetchaburi [Huai Sai, Puudja & Chokkulchana 663 (BKF, BKF [s]) [25 collections seen].

Distribution.— Endemic.

Ecology.— Found in open deciduous forest, in secondary and grazed forest and in swamp land; 50–900 m altitude. Reported over limestone, granite or shale. Flowering: (June–)July–Sept.–(Nov.).

Conservation.— Widespread in northern Thailand, and recorded also in the north-eastern, eastern and south-western region. IUCN red list category ‘Least Concern’ (IUCN, 2001).

Illustrations.— Seidenf. & Smitinand, Orchids Thailand: fig. 14a–e. 1959; Seidenf., Dansk Bot. Ark. 31(3): fig. 81a–d. 1977; present paper: fig. 21a–d.

Notes.— Habenaria hosseusii is quite common in the northern and eastern parts of Thailand. It is very close to H. dentirostrata with its lateral teeth on the tongue in front of the spur entrance, differing mainly in the shape of the tongue-apex (see above).


Terrestrial or epilithic, deciduous, glabrous. **Stems** (4.5–)10–19 cm tall. **Cataphylls** 1–2, tubular, enveloping the stem to 1 cm high; uppermost with a blade to 0.5 cm long. **Leaves** 2–4, adpressed to the substrate, radical, ovate to elliptic, somewhat cordate at the base, acute, mucronate, 1.4–4 by 1–1.4 cm, margins entire. **Bract-like leaves** (1–)4–9, suberect to spreading, narrowly lanceolate, acuminate, 0.5–1.8 cm long, margins entire, not or only shortly sheathing at the base. **Inflorescences** lax, (1–)3–7-flowered; rachis 3–5 cm long; floral bracts ovate-lanceolate, acuminate, 7–10 by 1.5–3 mm, shorter than the pedicel plus the ovary. **Flowers** 6.5–9 mm across; brownish or yellow-green. **Ovary** (including pedicel) 8–15 mm long. **Sepals** elliptic-lanceolate, rounded to subacute, 3-veined; median sepal erect, elliptic-ovate, 3.5–4(–4.5) by 1.5–3 mm; lateral sepals spreading, ovate-elliptic, 3.5–4(–4.5) by 1.7–3.4 mm. **Petals** elliptic-lanceolate to falcately linear-triangular, subacute or obtuse, forming a hood with the median sepal, 3–veined, 3.5–4.5 by 0.8–1.6 mm. **Lip** 4.5–10 mm long, deeply 3-lobed almost to the base; midlobe linear, (3.7–)5–9 by 0.2–0.3(–0.7) mm; side-lobes linear-filiform, 6–29 by 0.1–0.3 mm; spur cylindric, in the examined Thai specimens 5–7.6 mm long but outside our area often much shorter, forwards-curved, clavate in the distal half. **Gynostemium** 1–2.3 mm long, anther canals insigificant, stigmas ca 2 mm long, spreading. **Fruit** sessile, elliptic-fusiform, about 9.5 mm long, 3 mm in diameter, with a short apical beak to 1 mm long.

**Thailand.**— ? **NORTHERN**: Chiang Mai [Mae Taeng, Kerr s.n. (K H2007/02483-75)]; **SOUTH-WESTERN**: Kanchanaburi [Sai Yok, v. Beusekom et al. 3972 (BKF, C, C [s, L])]; **PENINSULAR**: Phangnga [Rue-see Cave, Taithong 1802 (BCU)] [3 collections seen, 1 of them uncertain].

**Distribution.**— India to Indochina and S China, also in Sumatra.

**Ecology.**— Found in moist places in bamboo thicket and in cracks in limestone, also collected in secondary, fire-damaged evergreen scrubland; 150–825 m altitude. Reported over sandstone or limestone. Flowering: Aug. and Nov.

**Conservation.**— Known from only three widely scattered localities. Small plants that are easily overlooked. **IUCN** red list category ‘Endangered’ based on geographic range and decline (B2a,b(iii); IUCN, 2001).


**Notes.**— This and the following five species Habenaria humidicola, H. porphyricola,
*H. humistrata*, *H. siamensis* and *H. poilanei* form a group of similar and probably closely related species which share the slender habit, the (1–)2–4 radical leaves which are adpressed to or spreading just above the substrate and their small or medium-sized flowers with simple petals and 3-lobed lips. *H. anomaliflora* shares the habit and the radical leaves which are adpressed to the substrate but differs by having flowers with a subactinomorphic perianth. It has been suggested that this species is a constant abnormality (Kurzweil et al., 2009). Another similar species in the group is the Indian *H. diphylla* (Nimmo) Dalzell, which is possibly conspecific with our *H. humistrata* (Seidenfaden, 1977). A taxonomic revision of the species complex over its entire distribution range is not yet available.


Terrestrial, deciduous, glabrous. Stems 21.5 cm tall. Leaves 4, radical and spreading just above the soil surface, elongate-ovate to elliptic, subacute or acute, 4–7 by 1.2–2.2 cm. Bract-like leaves 7, erect or suberect, narrowly lanceolate, acuminate, 1.2–2 cm long. Inflorescences lax, 13-flowered; rachis 8 cm long; floral bracts ovate-lanceolate, acuminate, lowermost 11 by 3.3 mm long. Flowers ca 9 mm across; light green. Ovary (including pedicel) ca 11 mm long. Sepals ovate or ovate-lanceolate, rounded to subacute; median sepal erect, ca 3.8 by 3.3 mm, with three prominent thickened veins; lateral sepals spreading, ca 4.3 by 2.2 mm. Petals linear, slightly curved forwards, forming a hood with the median sepal, subacute or obtuse, ca 4.2 by 0.9 mm. Lip ca 6 mm long, 3-lobed to the base; midlobe linear, ca 5 by 0.7 mm; side-lobes linear-filiform, ca 7 by 0.4 mm; spur cylindric or slightly clavate in the middle, pendent, 7–8 mm long. Gynostemium ca 1.8 mm long, anther with a moderately wide connective between the thecae, anther canals insignificant, stigmas ca 1.5 mm long, spreading.

Thailand.— NORTHERN: Chiang Mai [Doi Chiang Dao, Tripetch s.n. (QBG [s])] [1 collection seen].

Distribution.— S China.

Ecology.— The only Thai specimen known was found growing in humus in a limestone area at ca 1600 m altitude. Flowering: Aug.

Conservation.— In Thailand this species is currently known from a single population, and its national conservation status can therefore not be assessed properly. Small plants that are easily overlooked. IUCN red list category ‘Data Deficient’ (IUCN, 2001).


Notes.— This is a new record for Thailand. The species is very close to *Habenaria reniformis* as already pointed out by Seidenfaden (1977).


Terrestrial, deciduous, glabrous. Stems (10–)16–23 cm tall. Leaves 2–3, radical, adpressed to the substrate, ovate-acute, sometimes cordate at the base, (2–)2.3–6 by 1.3–3 cm. Bract-like leaves (3–)4–6, erect with spreading tip, narrowly lanceolate, acuminate, 0.8–2.5 cm long, largely sheathing, the upper denticulate or papillose on the margins. Inflorescences lax, (1–)2–5-flowered; rachis 2–6.5 cm long; floral bracts ovate-lanceolate, acuminate, 7–12 by 3–4(–5) mm, shorter than the pedicel plus the ovary, denticulate or papillose on the margins. Flowers 13–14 mm across; lateral sepals and petals pale greenish, lip and proximal spur half white, distal spur half light green. Ovary (including pedicel) 13–15(–17) mm long, ribs denticulate or papillose.

Thailand.— NORTHERN: Chiang Mai [Mae Chaem, without collector 9567 (C [s] vial 411)]; Lamphun [Doi Khun Tan National Park, Maxwell 94-1047 (BKF, ScCMU, ScCMU [s], L)]; Tak [Wang Chao, Hosseus 53 (lectotype P)] [3 collections seen].

Distribution.— Endemic.

Ecology.— Found in dipterocarp-oak forest; 130–700 m altitude. Reported over shale. Flowering: Sept.

Conservation.— Three collections from the north have been seen. Small plants that are easily overlooked. IUCN red list category ‘Endangered’ based on geographic range and decline (B2a,b(iii); IUCN, 2001).


Notes.— This is a very poorly known species, recorded only three times so far. The most obvious character differentiating this species from all others in the group are the long spurs and the long stigma lobes which are about three to five times longer than the anther canals.

Terrestrial, deciduous, glabrous. Stems 10–25(--29) cm tall. Cataphyll 1, tubular, sheathing, enveloping the stem to 0.5 cm high. Leaves (1–)2–3, radical, adpressed to the substrate, orbicular or ovate, slightly mucronate, 1.4–2.3(–5) by (1.1–)1.8–2.8 cm, margins sometimes pale and semi-translucent. Bract-like leaves 1–3(–5), erect, narrowly lanceolate, acuminate, (0.7–)0.9–1.4 cm long, not or only shortly sheathing. Inflorescences lax, (1–)2–10-flowered; rachis 1–10(–15) cm long; floral bracts ovate-lanceolate, acuminate, (4–)6.8–11 by 2–3.5 mm, much shorter than the pedicel plus the ovary. Flowers 8–15 mm across (excluding the lip lobes); sepals greenish brown or green, lateral sepal inside whitish, petals light green, bases of sepals and petals sometimes white, lip green and white, stigma lobes black. Ovary (including pedicel) 13–16 mm long, erect and close to the rachis. Sepals obtuse or subacute, margins sometimes denticulate; median sepal erect, broadly elliptic, (4.5–)5–6.5(–6.8) by 3–5.5 mm; lateral sepals spreading, ovate-elliptic, 5.2–6(–8) by 3–4 mm. Petals erect, cohering with the median sepal, falcately linear-triangular, subacute, 5.2–7 by 1–2 mm, basally united with the lip. Lip 8–13 mm long, deeply 3-lobed nearly to the base; midlobe linear, 6.8–9(–12) by ca 0.5 mm; side-lobes linear-filiform, forming a right angle with the midlobe, 10–20(–25) by 0.3–0.4 mm; spur normally cylindric, rarely strongly clavate, mostly 4.8–8(–9) mm long, shorter than the pedicel plus the ovary. Gynostemium 3–3.3 mm long, anther thecae separated by a wide connective, lateral rostellum arms tapering, stigmas ca 2 mm long.

Thailand.—NORTHERN: Mae Hong Son [Mae Sariang, Pumicong 394 (QBG, QBG [s], SING); idem., Pumicong 398 (QBG, QBG [s]); Ban Rak Thai, Suksathan 4257 (QBG [s]); Huai Hei, Triboun 439 (l) (BK [s])); Chiang Mai [Doi Suthep, Kerr 194 (holotype K, isotypes C, L, P); idem., Kerr 350 (C, K); idem., Nanakorn et al. 12635 (QBG [s]); idem., Seidenfaden & Smitinand 2806 (C [s]); idem., Seidenfaden & Smitinand 3007 (C [s]); idem., Seidenfaden & Smitinand 3021 (C [s]); idem., Seidenfaden & Smitinand 3028 (C [s]); idem., Sørensen et al. 3908 (C); idem., Sørensen et al. 5110 (BKF, C); Sørensen et al. 5125b (BKF); Mae Rim, Pumicong 360 (QBG [s]); idem., Pumicong 361 (QBG, QBG [s]); ? Mae Taeng, Kerr s.n. (C [s] vial 152); Chiang Dao, Maxwell 89-1095 (CMU); Muang, Maxwell 88-1038 (BKF, CMU, L); San Kam Phaeng District, Maxwell 96-1191 (SeCMU, ScCMU [s], L); no exact locality, Maxwell 78-1038 (L)]; NORTH-EASTERN: Loei [Phu Ruea National Park, Thammatawon 161 (KKU [s]); idem., Thammatawon 166 (KKU [s]); Sakon Nakhon [Phu Phan National Park, Thammatawon 40 (KKU [s])]; EASTERN: Chaiyaphum [Pa Hin Ngam National Park, Suddee 164 (BCU [s]); no exact locality, Thaithong 759 (BCU [s]); Ubon Ratchathani [Pha Taem, Boonjaras 5 (BCU)]; CENTRAL: Nakorn Nayok [Khao Yai National Park, Maxwell 00-351 (SeCMU [s])]. [28 collections seen, 1 of them uncertain].

Distribution.—Endemic.

Ecology.—Locally common in humid or sandy soil in deciduous dipterocarp-oak forest, evergreen hill forest and pine forest; 190–1200 m altitude. According to collector’s notes it is found over granite or shale. Flowering: June–Sept.(–Oct.).

Conservation.—The species is known from a large number of collections made in northern, north-eastern, eastern and central Thailand and does not appear to be particularly rare, although it was listed in a book on threatened plants of Thailand (Suddee, 2005: 130). Several of the known localities are situated in national parks. Moreover, the species
may have been frequently overlooked given the small plant size. IUCN red list category ‘Least Concern’ (IUCN, 2001).

Illustrations.— Seidenf. & Smitinand, Orchids Thailand: fig. 21a–e. 1959; Seidenf., Bot. Tidsskr. 68: fig. 2a–b. 1973; Dansk Bot. Ark. 31(3): fig. 83a–d. 1977; present paper: fig. 22a–b.

Notes.— This species has small basal leaves adpressed to the ground and small greenish and white flowers. Its obvious characters are the erect ovaries resulting in the position of the flowers close to the rachis (and consequently a narrow inflorescence) and the lip side-lobes which are forming a right angle with the midlobe, both of which are differentiating characters from Habenaria siamensis. Also the gynostemium is different from that of H. siamensis, in that its thecae are separated by a widened connective.

The collection Triboun 439 (l) (BK!) is somewhat aberrant with its strongly clavate spur which is about 1.5 mm thick.

Figure 22. Habenaria humistrata Rolfe ex Downie: a. flower; b. gynostemium. All from the type specimen. Reproduced with permission from the University of Copenhagen, drawn by Kai Olsen.

Terrestrial, deciduous, glabrous except for the bract margins. **Stems** 8–12.5 cm tall. **Leaves** 2(–3), radical, adpressed to the substrate, broadly ovate-lanceolate to cordate, mucronate, 1.9–3(–4.8) by 1.5–2.1(–2.4) cm, margins sometimes pale and semi-translucent. **Bract-like leaves** 3–4, suberect, narrowly lanceolate, acuminate, 0.8–2 cm long, only shortly sheathing at the base, margins entire or shortly glandular-hairy; lowest bract-like leaf sometimes foliaceous, to 4 by 1.5 cm. **Inflorescences** lax, 2–9-flowered; rachis 1–5 cm long; floral bracts ovate-lanceolate, acuminate, 7–13 by 2.2–3 mm, shorter than the pedicel plus the ovary, margins shortly glandular-hairy. **Flowers** to 15 mm across (excluding lip); greenish yellow or white. **Ovary** (including pedicel) 11–17 mm long, patent. **Sepals** rounded to subacute; median sepal erect, broadly elliptic, 5.8–7 by 3–5 mm; lateral sepals spreading, ovate-elliptic, 6.5–7(–8) by 2.5–3(–3.7) mm. **Petals** erect, falcately triangular, subacute, 6–7 by 1.8–3 mm. **Lip** 11–12 mm long, 3-lobed almost to the base, sometimes with lateral auricles in the basal portion; midlobe linear, 7–11 by ca 0.6 mm; side-lobes linear-filiform, forming an acute angle with the midlobe, (11–)15–16(–18) by ca 0.3 mm; spur cylindric, 7–12.5 mm long, thickened in its upper half, usually shorter than the pedicel plus the ovary. **Gynostemium** 1.5–3 mm long, thecae adjacent, auricles rather high, lateral rostellum lobes short, bent upwards and widening towards a broadly truncate apex.

**Thailand.**—**NORTHERN:** Chiang Mai [Mae Chaem, *Kerr* 488 (BK, K)]; Tak [Wang Chao, *Hosseus* 52 (lectotype K; isolecototypes BM, L)]; **NORTHEASTERN:** Sakon Nakhon [Kusuman, *Pooma* et al. 2593 (L); no exact locality, *Thaithong* 890 (BCU [s])]; without locality: *Nanakorn* et al. 12129 (QBG [s]) [5 collections seen].

**Distribution.**—S China (Guizhou).

**Ecology.**—Found in grassy places in evergreen forest; 170–1500 m altitude. Flowering: Aug.

**Conservation.**—Known from only four widely scattered localities in northern and north-eastern Thailand plus an unknown one. It was listed in a book on threatened plants of Thailand (Suddee, 2005: 130). Small plants that are easily overlooked. IUCN red list category ‘Endangered’ based on geographic range and decline (B2a,b(iii); IUCN, 2001) (see also Santisuk et al., 2006).

**Illustrations.**—Seidenf., Dansk Bot. Ark. 31(3): fig. 82a–c. 1977.

**Notes.**—This is a rare species with small basal leaves adpressed to the ground and small greenish yellow or white flowers. It can easily be distinguished from *Habenaria humistrata* by the patent ovaries (and consequently wider inflorescences) and by the lip side-lobes which form an acute angle with the midlobe. Also the structure of the gynostemium is different with its adjacent thecae and the short lateral rostellum lobes that are bent upwards and are widening towards their truncate apex.
The collection Kerr 488 (K!) was apparently identified as *Habenaria porphyricola* in error by Seidenfaden (November 1975); it is clearly *H. siamensis* and was also listed as such in a later publication (Seidenfaden, 1977).

*Habenaria siamensis* was considered endemic to Thailand, but its occurrence has recently been reported in China (Chen et al., Fl. China 25. In prep. Internet draft version) which is an interesting range extension. While the relevant specimen has not been seen for the present study, the description in the Flora of China clearly fits the species although the flowers of the Chinese plants are slightly larger than those of the Thai specimens.


Terrestrial, deciduous, glabrous. *Stems* 15–20 cm tall. *Leaves* 2, radical, spreading just above the soil surface, elongate-ovate to elliptic, subacute, unequal in size, 6–8 by 3–5 cm. *Bract-like leaves* 3, spreading or erect, narrowly lanceolate, acute, to 1.5 cm long. *Inflorescences* lax and rather wide, 5-flowered; rachis 3–5 cm long; floral bracts ovate-lanceolate, acuminate, ca 8 by 3.4 mm. *Flowers* to 14 mm across; white with green median sepal and spur. *Ovary* (including pedicel) patent, ca 17 mm long. *Sepals* subacute; median sepal erect, ovate, outside with 3 rather pronounced veins, 4.5–5 by ca 3.3 mm; lateral sepals spreading, ovate-elliptic, ca 6.3 by 4 mm. *Petals* forming a hood with the median sepal, lorate-spathulate, obtuse, ca 5 by 1.7 mm. *Lip* ca 7.5 mm long, 3-lobed almost to the base; midlobe linear, ca 6.5 by 0.6 mm; side-lobes linear, upwards-curved, base forming a right angle with the midlobe, ca 5 by 0.8 mm; spur pendent, ca 14 mm long, strongly clavate in the upper half. *Gynostemium* ca 2.8 mm long, anther canals ca 1 mm long, stigmas ca 1 mm long.

Thailand [1 collection seen].— SOUTH-EASTERN: Rayong [Khao Chamao National Park, *Tripetch* 005 (QBG [s])].

Distribution.— Laos and Vietnam.

Ecology.— The single specimen that was available for study was collected in an open area in soil among granite rocks; ca 100 m altitude. Flowering in May.

Conservation.— In Thailand currently known from a single population found in a national park. Small plants that are easily overlooked. Proposed IUCN red list category ‘Data Deficient’ (IUCN, 2001).


Notes.— The plant does not match any species currently known in Thailand but fits the concept of the Indochinese *Habenaria poilanei* Gagnep. rather well. However, the Thai plant is more slender and has fewer flowers than the type collection of *H. poilanei*, and also the orientation of the lip side-lobes differs. The species is generally similar to *H. humistrata* but has patent ovaries and mostly larger flowers (Seidenfaden, 1977: 134). If the identification is confirmed this would be a new record for Thailand.

Terrestrial, deciduous, glabrous. Stems 16–25 cm tall. Cataphylls few, tubular, sheathing. Leaves 2, radical, adpressed to the soil, orbicular or ovate, acute, mucronate, 2–4 by 1.6–3.8 cm, one leaf larger than the other. Bract-like leaves 3–6, erect but spreading in their upper part, narrowly lanceolate, acuminate, 0.9–1.2 cm long, shortly sheathing in the basal part. Inflorescences lax, (1–)5–8-flowered; rachis 4–8.1 cm long; floral bracts ovate-lanceolate, acuminate, 6.6–11 by 2.2–4 mm, shorter than the ovaries plus the pedicel. Flowers 4–8 mm across, subactinomorphic with subequal sepals, petals and lip, without a spur; sepals, petals and lip greenish on the outside, inside of petals and lip white, gynostemium dark green; sepals, petals and lip ovate-lanceolate, acute or subacute, with three or five prominent dark veins, margins entire, median surface papillate in their upper part; flowers rarely opening up fully. Ovary (including pedicel) 10–14.5 mm long. Sepals: median sepal 5.6–7 by 2.2–5 mm, lateral sepals 5.5–6.5 by 2–3 mm. Petals 4.9–6.5 by 1.8–2.8 mm. Lip 4.5–6.5 by 2–3.5 mm. Gynostemium 1.5–2 mm long, with two prominent 3-lobed organs, one of them probably representing the anther with its laterally protruding anther canals, the other probably representing the rostellum, stigmas stout, clavate-globular, curved forwards. Fruit fusiform, 12–15 by 2.5–3 mm.

Thailand.—CENTRAL: Nakhon Nayok [Khao Yai National Park, Buakhlai 158 (holotype PSU [s], isotypes BCU, BKF); idem., Maxwell 00-351 (BKF, ScCMU, L); idem., Tripetch A03 (QBG [s])] [3 collections seen].

Distribution.—Laos.

Ecology.—In secondary, fire-damaged evergreen forest or scrubland over sandstone, sometimes locally common; 700–825 m altitude. Flowering: Aug.–Oct.

Conservation.—Only three collections from central Thailand are known. Small plants that are easily overlooked. IUCN red list category ‘Endangered’ based on geographic range and decline (B2a,b(iii); IUCN, 2001).


Notes.—Habenaria anomaliflora resembles H. humistrata, H. siamensis, H. porphyricola and H. reniformis it its habit with the 2–3 small leaves adpressed to the ground but differs by having subactinomorphic and spurless flowers. The gynostemium of the species is unlike that of any other related orchid and appears to be strongly reduced in all of its organs. It has been suggested that H. anomaliflora is a Habenaria-like monstrosity (Seidenfaden, 1992). As this suspected abnormality is known from four collections (three from Thailand, one from Laos) and is apparently constant in its appearance it was described as a distinct species.

Interestingly, the species was once found growing in the same population together with Habenaria humistrata (collected under the same number, Maxwell 00-351, ScCMU
This could suggest that *H. anomaliflora* is an abnormal form of the latter species, but could equally well also imply that the colony of plants was a mixed population of two different species.

Apparently also found in Phu Ruea National Park in Loei Province (Tripetch, pers. comm.).


Normally epilithic, deciduous, glabrous except for the petal margins and the lip. *Stems* (5–)11–25 mm tall, smooth or papillose. *Cataphylls* 2–3, tubular and partly sheathing with free apical portion, to 5 cm long. *Leaves* 2–4, spreading, basal, lanceolate, acute or acuminate, mucronate, 5.5–9 by 8–15 mm, often papillose; to 5 cm long, anther canals ca 4 mm long, central rostellum lobe prominent and foliaceous, to 5 b 5–10 mm, much shorter than the pedicel plus the ovary, margins papillose. *Flowers* to 22 mm wide and 30 mm long; pink or rarely white, lip apex sometimes pink in white flowers. *Ovary* (including pedicel) (19.4–)22–28 mm long, papillose. *Sepals* rounded to subacute; median sepal erect, narrowly ovate to elliptic, 6–10 by 3–6 mm, sometimes papillose on the median vein; lateral sepals spreading, ovate, 8–10.5 by 6–10 mm. *Petals* erect, cohering with the median sepal, broadly ovate, with one or two veins branching just above the base, 6–9 by 4–6 mm, front margins sometimes minutely glandular-hairy. *Lip* 18–30 mm long, 3-lobed, almost always shortly hairy on the upper surface and on the margins; midlobe obovate or spathulate, (10–)22–25 by (10–)12–15 mm, apically deeply incised, often with a small lobule in the incision; side-lobes flabellate, entire, (9–)18–20 by 7–8 mm; spur cylindrical and widened in the upper half, 35–43(–55) mm long. *Gynostemium* 3.5–4.5 mm long, anther canals ca 4 mm long, central rostellum lobe prominent and longer than the anther, auricles prominent and raising above the anther canals.

exact locality, Thaitong 752 (BCU [s]); WITHOUT LOCALITY: Punicong 489 (QBG [s]); Thammatawon 117 (KKU [s]) [12 collections seen].

Distribution.— Peninsular Malaysia.

Ecology.— Occasionally found on limestone rocks in hill evergreen forest; normally at low altitudes. Flowering: July–Sept. (–Oct.).

Conservation.— Twelve collections mainly from Peninsular Thailand have been seen. The plants are potentially threatened by collection for commercial purposes as they are horticulturally desirable. IUCN red list category ‘Near Threatened’ (IUCN, 2001).


Notes.— This and the following species Habenaria rhodocheila share a massive central rostellum lobe and a 3-lobed lip with wide lobes. Unlike in the other Thai Habenaria species the flowers of H. rhodocheila and H. carnea are rather brightly coloured (pink or white in H. carnea; red, orange, pink or yellow in H. rhodocheila). H. carnea is easily distinguished from the much more common H. rhodocheila by its ovate petals. Also the auricles which are raised above the anther canals are a distinct feature of H. carnea.

The collection Worachat 271 (KKU [s]!) is said to come from Phu Phan National Park in Sakon Nakhon Province (north-eastern Thailand) which is an interesting disjunction.

The distribution cited in the original description, ‘a native of Singapore’, is probably erroneous as, in Peninsular Malaysia, this species is currently only known from Langkawi and further north (which is about 700 km away).


subsp. rhodocheila

Mostly terrestrial or epilithic, deciduous, glabrous. Stems (10–)16–25(–42) cm tall, smooth or elongate-papillose. Cataphylls 2–3, tubular, sheathing, enveloping the stem to 5(–9) cm high, uppermost with a blade to 1.5 by 0.8 cm. Leaves (2–)4–5(–7), spreading, cauline and scattered in the lower stem half, lanceolate-oblong, acute, mucronate, 4–17(–24) by (0.6–)1–1.9(–3.8) cm, green or rarely with greyish-green
mottling, sometimes with reddish margin, margins sometimes papillose. *Bract-like leaves* 2–8(–11), mostly suberect, lanceolate, acuminate, 1.8–4(–8) cm long, basally sheathing, often membranous, margins papillose; the lower 1–3 sometimes foliaceous and spreading. *Inflorescences* lax, (1–)2–10(–20)-flowered; rachis (1–)2–6 cm long, mostly papillose, green or light pinkish; floral bracts ovate-lanceolate, acuminate, (7.5–)15–22(–30) by 4–6(–7) mm, margins sometimes reddish or minutely denticulate. *Flowers* (20–)22–35 mm across; red, orange, pink or yellow, also reported as sepals and petals greenish with red lip, lateral sepals sometimes whitish green, petals once reported as green, spur whitish brown or orange and rarely light maroon, reddish green or orange, gynostemium orange, reddish or whitish-yellow, pollinia orange, rostellum and stigma processes whitish-yellow or red; flowers once reported as slightly scented. *Ovary* (including pedicel) 19–32 mm long, smooth, sometimes orange- or brownish-tinged. *Sepals* subacute; median sepal erect, broadly elliptic, (6–)7–9(–15) by 6–7(–10) mm; lateral sepals slightly obliquely ovate, reflexed, (5.5–)8–12 by 3.5–6 mm, sometimes partly rolled-in, basally united with the lip. *Petals* erect, forming a hood with the median sepal, elliptic-lorate, subacute, 1-veined, 6–7.8(–13) by 1.5–2.2(–3) mm, sometimes with a pronounced rounded apical lobe on the front side. *Lip* (16–)18–27(–35) by (12–)14–23 mm, 3-lobed with a claw 2–5(–8) mm long, somewhat papillose, with a collar in front of the spur entrance; midlobe spathulate, 9–14–19 by (7.5–)9–13(–19) mm, apically bifid with the incision normally 3–5(–7) mm deep, apical incision sometimes with a minute lobule; side-lobes flabellate, mostly oblong-ovate, (9–)11–13(–21) by 4–6.3(–9) mm; spur cylindrical, (30–)35–45(–50) mm long, sometimes thickened apically. *Gynostemium* 3–5 mm long, anther canals 4–8 mm long, anther with an apical connective process, central rostellum lobe prominent and longer than the anther; auricules small and insignificant. *Fruit* elliptic-fusiform, 28.1–38 mm long, 4–5.2 mm in diameter, with a short stalk up to 6 mm long and an apical beak of about 3 mm.

Thailand (selected specimens only).—NORTHERN: Mae Hong Son [Doi Pui, Larsen et al. 46815 (AAU, BKF, SING); Pang Mapha, Srisanga & Puff 1063 (QBG)]; Chiang Mai [Doi Chiang Dao, Garrett 1003 (BKF, K); Mae Rim, Nanakorn et al. 1316 (QBG); Muang, Nanakorn et al. 4658 (QBG); Omkoi, Petmitr 473 (SeCMU, SeCMU [s]); Doi Inthanon, Shunsuke Tsagaru T 61846 (BKF)]; Nan [Sri Naan National Park, Maxwell 04-349 (SeCMU, SeCMU [s]); Sapan Waterfall, Srisanga 1585 (QBG)]; Lamphun [Doi Khun Tan National Park, Maxwell 94-1054 (SeCMU, SeCMU [s]); Lamphang [Chae Son National Park, Maxwell 95-532 (SeCMU, SeCMU [s]); Doi Luang National Park, Maxwell 97-917 (BKF, SeCMU, SeCMU [s])]; NORTH-EASTERN: Phetchabun [Thung Salaeng Luang National Park, Seidenfaden & Smitinand 5376 (C [s])]; Loei [Phu Kradueng National Park, Adisai 825 (BK); Na Haew, Nanakorn et al. 9477 (QBG); Phu Rua National Park, Worachat 180 (KKU [s]); Phu Luang National Park, Phusomsaeng & Bunchuai 2 (BKF, K, L)]; Nong Khi [Tambon Nong Dern, Nielsen et al. 1615 (BKF)]; Sakon Nakhon [Phu Phan National Park, Thammtawon 94 (KKU [s])]; Nakhon Phanom [Banpong, Krachai 375 (KKU)]; Mukdahan [Huai Huat National Park, Pooma et al. 2550 (BKF, BKF [s]); idem., Pooma et al. 2571 (L)]; EASTERN: Chaiyaphum [Phu Khieo, Larsen et al. 31322 (AAU, C); Pa Hin Ngam National Park, Suddee 116 (BCU, BCU [s])]; Nakhon Ratasiima [Pak Thong Chai, Charoenphol et al. 4530 (AAU); Khao Yai National Park, v. Beusekom & Charoenphol 1797 (AAU, BKF, C, L, P)]; SOUTH-
WESTERN: Kanchanaburi [Huai Ban Kao, Geesinck & Phengkla 6113 (AAU, BKF, C, C [s], L, P); Thong Pha Phum, Maxwell '73-144 (AAU, BK)]; Kanchanaburi [Thung Kang Yang, Larsen 10555 (C [s])]; CENTRAL: Nakhon Nayok [Khao Yai National Park, Boonkongchart 159 (BK, SeCMU, SeCMU [s]); Wang Ta Krai, Robinson K243 (K [s]); Muang District, Maxwell '72-365 (BK)]; SOUTH-EASTERN: Prachin Buri [Thaithong 139 (BCU)]; Chanthaburi [Bunnak 503 (BK, C, C [s])]; Ta Sen falls, Larsen et al. 32365 (AAU, C)]; PENINSULAR: Ranong [Ngaw Waterfall Forest Reserve, Fukuoka & Nanakorn T 35881 (BK)]; Phangnga [Klong Naka Wildlife Sanctuary, WN 726 (BK)]; Nakhon Si Thammarat [Khiriwong, Bunnak 752 (BK, C); Khao Luang National Park, Maxwell 84-492 (BK, PSU); Khao Rum, Smith 533 (C, K, L); Thap Chang, Seidenfaden & Smitinand 6395 (C [s]); Lan Saka District, Santisuk & BN 520 (BK)]; Phattalung [Tha Mot, Larsen et al. 44166 (AAU, SING); Plai Wan Falls, Pedersen 41608 (AAU)]; Trang [Khao Chong, Pedersen 41379 (AAU)] [93 collections seen, 1 of them uncertain].

Distribution.— Myanmar to SE China, also Peninsular Malaysia and the Philippines.

Ecology.— This species is common on open wet ground or as a lithophyte on the floor of evergreen or mixed deciduous forest, often found alongside streams and near waterfalls; once reported as an epiphyte on a moss-covered tree 5 m over a river; frequently also found in grassy pine forest or in bamboo-rich forest, also reported in dry dipterocarp forest. The most common altitudinal range is from 200–900 m, but individual collections have been made as low as 1.5 m and as high as 1300 m altitude. Limestone, sandstone, shale or granite have been reported as the bedrock. Flowering: (June–)July.

Conservation.— Widespread and common throughout Thailand. The plants are horticulturally desirable and are therefore potentially threatened by collection for commercial purposes. IUCN red list category ‘Least Concern’ (IUCN, 2001).


Notes.— Some of the colour forms of this variable taxon have been recognised as separate species in the past. On the basis of the flower morphology and particularly the lip structure several botanists feel that Habenaria rhodocheila in its present circumscription could be split into a few infrageneric taxa. After having examined a large number of collections I think that the variation is continuous, at least in Thailand, and have therefore recognised a single taxon. There do indeed seem to be a few forms but these are connected by numerous intermediate specimens.

Habenaria rhodocheila subsp. philippinensis (Ames) Christenson was recently described from the Philippines (Christenson, 1992: 90). It differs in its flower colour (green and white) but is also distinct in its petal and leaf shape.

A pink form was recently described as Habenaria erichmichaelii (Christenson, 2003), differing from H. rhodocheila in its flower and leaf colouring and in its rostellum...
morphology. The differences in the leaf colouring, green with pale spots, appear to be based on an error as also the leaves of a number of other specimens of *H. rhodocheila* have pale markings. The rostellum structure of *H. erichmichaelii* could not be examined as the type specimen could not be traced, but according to the photo that was supplied with the description it does not appear to differ fundamentally from that of *H. rhodocheila*.

The specimen *Eakkachai Aod-um-pai* s.n. (BCU [s] 009192!) has an only slightly emarginate lip midlobe (depth of incision ca 0.5 mm). Also the spur of this collection is unusual, measuring 50 mm in length (as opposed to 32–45 mm in typical specimens).

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**Figure 23.** *Habenaria rhodocheila* Hance: a. flower; b–c. gynostemium; d. petal. Reproduced with permission from the University of Copenhagen, drawn by Poul Juul.

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The genus *Habenaria* (Orchidaceae) in Thailand (H. Kurzweil)

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REFERENCES


The following list enumerates all Thai collections examined here. All species are abbreviated to the first four letters of their name, except *Habenaria rostrata* (= *rostr*), *H. rostellifera* (= *rostell*) and *H. dentirostrata* (= *dentirostr*). + indicates mixed collections. All illegible names were omitted from the list. Also specimens without collector’s number are not listed, unless accompanied by a specific herbarium number.

acui ... *Habenaria acuifera*
ampl ... *Habenaria amplexicaulis*
anom ... *Habenaria anomaliflora*
aust ... *Habenaria austrosexinis*
avan ... *Habenaria avana*
carn ... *Habenaria carnea*
chlo ... *Habenaria chlorina*
cili? ... cf. *Habenaria ciliolaris*
comm ... *Habenaria commelinifolia*
cory ... *Habenaria corymbosa*
dent ... *Habenaria dentata*
dentirostr ... *Habenaria dentirostrata*
eros ... *Habenaria erostata*
falc ... *Habenaria falcatopetala*
furc ... *Habenaria furcifera*
gode ... *Habenaria godefroyi*
hast ... *Habenaria hastata*
holo ... *Habenaria holotricha*
hoss ... *Habenaria hosseusii*
humi ... *Habenaria humistrata*
khas ... *Habenaria khasiana*
limp ... *Habenaria limprichtii*
lin ... *Habenaria lindleyana*
long ... *Habenaria longithea*
luc ... *Habenaria lucida*
mali ... *Habenaria malintana*
mand ... *Habenaria mandersii*
marg ... *Habenaria marginata*
medi ... *Habenaria medioflexa*
myri ... *Habenaria myriotricha*
pant ... *Habenaria pantlingiana*
poil? ... cf. *Habenaria poilanei*
porp ... *Habenaria porphyricola*
refl ... Habenaria reflexa
reni ... Habenaria reniformis
rhod ... Habenaria rhodocheila
rostell ... Habenaria rostellifera
rostr ... Habenaria rostrata
rump ... Habenaria rumphii
siam ... Habenaria siamensis
sten ... Habenaria stenopetala
thai ... Habenaria thailandica
tric ... Habenaria trichosantha
vidu ... Habenaria vidua
viri ... Habenaria viridiflora


Bänzinger 531: dent; – Baramee s.n. (BCU [s] 009896): pant; s.n. (BCU [s] 009944):
refl; – BCU s.n. (BCU [s] 008922): holo; s.n. (BCU [s] 008923); rump; – BKF s.n. (BKF 18288): rostell; – Bimpheng 895: rhod; – Boonjaras 5: humi; 112: dent + luci; 303: rostr + gode; – Boonkerd & al. KK 675: dent; KK 790: khas; KK 1042: sten; KK 1097: dent; KK s.n. (BCU 010429): dent; KK s.n. (BCU 010430): mali??; – Boonkongchart 159: rhod,

Chankaew 02: rhod; – Chantaranothai & al. 90/90: rump; 90/93: rump; – Charoenphol & al. 4530: rhod; 4809: rump; – Chermisiriwatthan 407: rhod; 788: dent; 1806: khas;


Kasem 258: rostell; 259: tric?; 260: mand?; 475: mand; 551: lind; 635: dent; 650: fusc;


THE GENUS HABENARIA (ORCHIDACEAE) IN THAILAND (H. KURZWEIL)


Ubolcholakhate 332: carn; – Umpai 653: rump.


INDEX

Accepted Thai species are given in bold and synonymous names in italics

_Aopla reniformis_ (D.Don) Lindl. 82
_Fimbrorchis medioflexa_ (Turrill) Szlach. 28
_Fimbrorchis myriotricha_ (Gagnep.) Szlach. 30
_Fimbrorchis myriotricha_ var. _confluentes_ (Gagnep.) Szlach. 28
_Fimbrorchis trichosantha_ (Lindl.) Szlach. 31

**Habenaria acuifera** Wall. ex Lindl. 52, 61, 75
_Habenaria acuifera_ auct. non. Wall. ex Lindl.: Smitinand 72
_Habenaria amplexicaulis_ Rolfe ex Downie 22, 24
_Habenaria anomaliflora_ Kurzweil & Chantanaorrapint 83, 89, 90
_Habenaria andamanica_ Hook.f. 16
_Habenaria andamanica_ auct. non Hook.f.: Seidenf. & Smitinand 15
_Habenaria aurantiaca_ Rolfe ex Downie 75, 76
_Habenaria austrosinensis_ Tang & F.T.Wang 33, 34, 35, 37
_Habenaria avana_ Hook.f. 76
_Habenaria beccarii_ Schltr. 16

**Habenaria carnea** Weathers 90
_Habenaria carnea_ var. _concolor_ Ridl. 90
_Habenaria carnea_ var. _minor_ Ridl. 90
_Habenaria chlorina_ E.C.Parish & Rchb.f. 54
cf. **Habenaria ciliolaris** Kraenzl. 37
_Habenaria clavaeformis_ Klinge 90
_Habenaria clovisii_ Gagnep. 82
_Habenaria columbca_ Ridl. 46, 47, 49
_Habenaria commelinifolia_ (Roxb.) Wall. ex Lindl. 32
_Habenaria corymbosa_ E.C.Parish & Rchb.f. 20, 23
_Habenaria craibiana_ Kerr & Rolfe, mss. 56
_Habenaria delessertiana_ Kraenzl. 17

**Habenaria dentata** (Sw.) Schltr. 39, 46, 84
_Habenaria dentirostrata_ Tang & F.T.Wang 78, 81
_Habenaria digitata_ Lindl. 23, 24
_Habenaria diphylla_ (Nimmo) Dalzell 83
_Habenaria downii_ Ridl., mss. 56
_Habenaria erichmichaelii_ Christenson 91, 93, 94
_Habenaria erostrata_ Tang & F.T.Wang 61
_Habenaria falcatopetala_ Seidenf. 19
_Habenaria flavescens_ Hook.f. 75

**Habenaria furcifera** Lindl. 63
_Habenaria fusifera_ Hook.f. 75
_Habenaria geniculata_ D.Don 39
_Habenaria godefroyi_ Rchb.f. 27
_Habenaria graminifolia_ Gagnep. 67
_Habenaria graminea_ Lindl. 67


Habenaria hamigera Griff. 63
Habenaria hastata Seidenf. 72
Habenaria holotricha Gagnep. 15
Habenaria hosseusii Schltr. 78, 79
Habenaria hosseusii auct. non Schltr.: Kerr 79
Habenaria humidicola Rolfe 82, 83
Habenaria humistrata Rolfe ex Downie 84, 86, 87, 88, 89
Habenaria khasiana Hook.f. 67, 70
Habenaria kingii Hook.f. 34
Habenaria kingii auct. non Hook.f.: Seidenf. & Smitinand 33, 34
Habenaria latifolia Lindl. 46, 49
Habenaria limprichtii Schltr. 24
Habenaria lindleyana Steud. 46
Habenaria linguella Lindl. 54
Habenaria longitheca Seidenf. 33
Habenaria lucida Wall. ex Lindl. 49
Habenaria macroptera Gagnep. 46
Habenaria malintana (Blanco) Merr. 43
Habenaria mandersii Collett & Hemsl. 43, 77, 79
Habenaria marginata Colebr. 75, 77
Habenaria marginata var. flavescens (Hook.f.) T.Cooke 75
Habenaria medioflexa Turrill 16, 28
Habenaria medioflexa auct. non Turrill: Kerr 28, 30
Habenaria medusa Kraenzl. 16, 31
Habenaria medusa auct. non Kraenzl.: Seidenf. 30
Habenaria militaris Rehb.f. 91
Habenaria murtonii Hook.f. 34
Habenaria myriotricha Gagnep. 16, 28, 30, 32
Habenaria myriotricha Gagnep. var. confluens Gagnep. 28
Habenaria oligoschista Schltr. 27
Habenaria oligoschista auct. non Schltr.: Seidenf. & Smitinand 24
Habenaria pantlingiana Kraenzl. 16, 19
Habenaria parageniculata Tang & F.T.Wang 39
Habenaria pectinata D.Don 27
Habenaria pectinata D.Don var. limprichtii (Schltr.) U.C. Pradhan 24, 27
Habenaria peloroides E.C.Parish & Rehb.f. 43
cf. Habenaria poilanei Gagnep. 88
Habenaria polytricha Rolfe 16
Habenaria polytricha (Hook.f.) Pradhan 16
Habenaria polytricha auct. non Rolfe: Seidenfaden 15
Habenaria porphyricola Schltr. 83, 88, 90
Habenaria porphyricola auct. non Schltr.: Kerr 84
Habenaria promensis Lindl. 75
Habenaria pusilla Rehb.f. 91
Habenaria recurva Rolfe ex Downie 49, 51, 52
Habenaria reflexa Blume 33, 34, 36, 37
Habenaria reniformis (D.Don) Hook.f. 82, 83, 90
Habenaria rhodocheila Hance subsp. rhodocheila 91
Habenaria rhodocheila subsp. philippinensis (Ames) Christenson 93
Habenaria roseata Ridl. 56, 57, 59
Habenaria rostellifera Rchb.f. 56, 60
Habenaria rostrata Wall. ex Lindl. 59, 62
Habenaria rumphii (Brongn.) Lindl. var. rumphii 72
Habenaria rumphii var. meraukensis J.J. Sm. 75
Habenaria seshagiriana A.N.Rao 16
Habenaria siamensis Schltr. 83, 86, 87, 90
Habenaria siamensis auct. non Schltr.: Seidenf. & Smitinand 84
Habenaria singapurensis Ridl. 20
Habenaria stenopetala Lindl. 17, 20
Habenaria stenopetala auct. non Lindl.: Gagnepain 19
Habenaria stenopetala Lindl. var. polytricha Hook.f. 16, 19
Habenaria sutepensis Rolfe ex Downie 17
Habenaria tenuis Griff. 69
Habenaria ternatea Rchb.f. 16
Habenaria thailandica Seidenf. 23, 24
Habenaria tonkinesis Seidenf. 71
Habenaria trichochila Rolfe ex Downie 28, 29
Habenaria trichosantha Lindl. 16, 31
Habenaria vidua E.C.Parish & Rchb.f. 62, 64
Habenaria viridiflora (Rottler ex Sw.) Lindl. 69
Habenaria xanthocheila Ridl. 91
Habenaria yuana Tang & F.T.Wang 27
Habenaria sp., Kerr 2681 89
Habenaria sp., Smitinand 3574 39, 41, 43
Habenella lucida (Wall. ex Lindl.) Szlach. & Kras-Lap. 49
Herminium reniforme (D.Don) Lindl. 82
Kraenzlinorchis dentirostrata (Tang & F.T.Wang) Szlach. 78
Kraenzlinorchis hosseusii (Schltr.) Szlach. 79
Kraenzlinorchis malintana (Blanco) Szlach. 43
Kraenzlinorchis mandersii (Collett & Hems.l.) Szlach. 77
Kryptostoma godefroyi (Rchb.f.) Olszewski & Szlach. 27
Kryptostoma limprichtii (Schltr.) Szlach. & Olszewski 24
Listera reniformis D.Don 82
Medusorchis holotricha (Gagnep.) Szlach. 15
Neottia reniformis (D.Don) Spreng. 82
Ochyrorchis godefroyi (Rchb.f.) Szlach. 27
Ochyrorchis limprichtii (Schltr.) Szlach. 24
Orchis commelinifolia Roxb. 32
Orchis dentata Sw. 39
Orchis viridiflora Rottler ex Sw. 69
Plantaginorchis dentata (Sw.) Szlach. 39
Platanthera acuifera Lindl. 52
Platanthera commelinifolia (Roxb.) Lindl. 32
Platanthera dentata (Sw.) Lindl. 39
Platanthera geniculata (D.Don) Lindl. 39
Platanthera linifolia Lindl. 67
Platanthera lucida Lindl. 49
Platanthera marginata (Colebr.) Lindl. 75
Platanthera rostrata Lindl. 59
Platanthera rumphii Brongn. 72
Platantheroides lucida (Wall. ex Lindl.) Szlach. 49
Smithanthe carnea (Weathers) Szlach. & Marg. 90
Smithanthe rhodocheila (Hance) Szlach. & Marg. 91
Thelymitra malintana Blanco 43