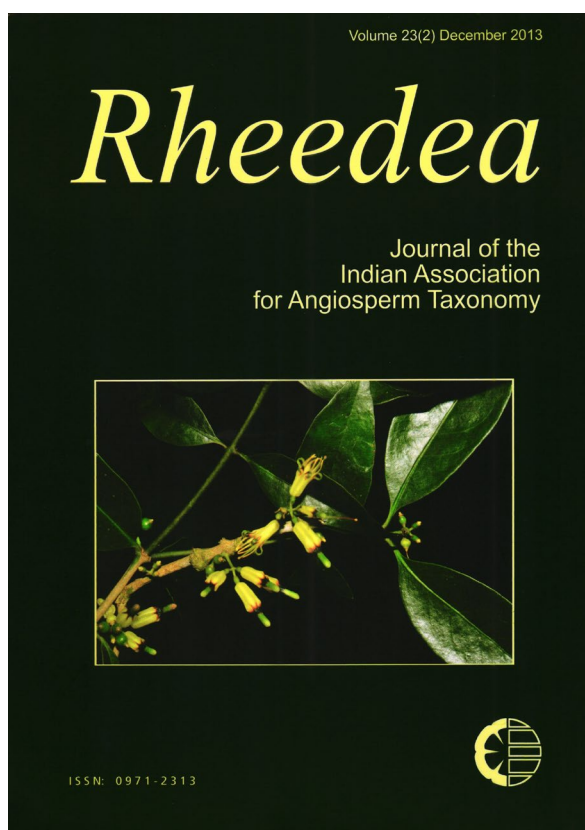




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A brief account of the genus *Bulbophyllum* (Orchidaceae) in Manipur, India

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Abstract

The paper deals with 24 species of *Bulbophyllum* reported so far from Manipur. A key to the identification of the taxa in Manipur, brief description, phenology, short note on ecology and distribution for each species are provided. Colour plate for 10 taxa is provided for easy identification.

Keywords: Orchidaceae, new record, identification key, NE India, *Bulbophyllum*

Introduction

Manipur, one of the biodiversity rich states of North Eastern India is located between 23° 68' N - 25° 68' N and 93° 03' E - 94° 78' E spreading over an area of about 22,327 km². The state is fortified on all sides by lofty mountains, the highest being Mount Tenup of Iso which is 2999 m above sea level. There are about 284 species of orchids belonging to 87 genera reported so far from the state (Sathish Kumar & Suresh Kumar, 2005; Kishor *et al.*, 2012; Chowlu *et al.*, 2012; Nanda, 2012).

Bulbophyllum Thouars with about 1900 species is one of the largest genera of the family Orchidaceae. They are distributed mainly in tropical regions of both old and new worlds (Chen & Vermeulen, 2009). A review of literature (Hooker, 1890; Mukerjee, 1953; Pradhan, 1979; Seidenfaden, 1979; Ghatak & Devi, 1986; Kataki, 1986; Hyniewata *et al.*, 2000; Sathish Kumar & Suresh Kumar, 2005; Rao, 2007; Lucksom, 2007; Mishra, 2007) reveals that the genus *Bulbophyllum* is represented by c.100 species in India, of which c. 75 species and 3 varieties are distributed in NE India and about 14 species are found in Manipur. Explorations in various districts of Manipur by the team of Scientists from the Centre for Orchid Gene Conservation of Eastern Himalayan Region (COGCEHR), Hengbung could collect many interesting orchid species which were not reported from the state including nine species and one variety of *Bulbophyllum*, viz. *B. affine* Lindl., *B. cariniflorum* Rchb.f., *B. hirtum*

(Sm.) Lindl., *B. polyrrhizum* Lindl., *B. retusiusculum* Rchb.f., *B. rufinum* Rchb.f., *B. scabratum* Rchb.f., *B. secundum*, Hook.f., *B. trichocephalum* (Schltr.) Tang & F.T. Wang var. *capitatum* Lucksom and *B. xylophyllum* C.S.B. Parish & Rchb.f.

All the 24 taxa of *Bulbophyllum* represented so far (including the present findings) from Manipur are enumerated below in alphabetical order along with identification key, brief description and distribution details. Colour photos of all new additions to the state are provided to facilitate easy identification of the taxa. The herbarium specimens of various species mentioned in the following text are deposited in the Herbarium of Centre for Orchid Gene Conservation of Eastern Himalayan Region (COGCEHR), Hengbung, Senapati district of Manipur.

Key to the species

1. Leaf solitary 2
1. Leaves two 21
2. Pseudobulbs absent or indistinct 3
2. Pseudobulbs present 4
3. Inflorescence 15–30 cm long, 30–40 flowered, Spike cylindric **B. khasyanum**
3. Inflorescence 5–6 cm long, 12–14 flowered, capitates **B. xylophyllum**

4. Flowers solitary 5
 4. Flowers many 8
 5. Flowers less than 1.5 cm across 6
 5. Flowers more than 2 cm across 7
 6. Inflorescence 1.5–2.8 cm long; flowers 1.2–1.5 cm across, pale yellow with scarlet spots; sepals fleshy **B. leopardinum**
 6. Inflorescence c. 1 cm long; flowers 7–9 mm across, yellow with brownish orange stripes; sepals thin **B. moniliforme**
 7. Leaf oblong, obtuse or notched; flower 2.5–3.0 cm across; lateral sepals straight, without concavity at base **B. affine**
 7. Leaf narrowly oblong, acute; flower 5–7 cm across; lateral sepals concave at base and falcate **B. lobbii**
 8. Inflorescence elongate raceme; flowers laxly arranged; rachis much longer than peduncle 9
 8. Inflorescence an umbel; flowers densely arranged; rachis shorter than peduncle 12
 9. Lip edges hairy **B. secundum**
 9. Lip edges not hairy 10
 10. Flowers orange yellow; lip 3-lobed . **B. rufinum**
 10. Flowers yellowish green; lip entire 11
 11. Pseudobulbs distant on rhizome; leaf present during flowering **B. reptans**
 11. Pseudobulbs closed together; leaf absent during flowering **B. polyrrhizum**
 12. Inflorescence few-flowered, umbel 13
 12. Inflorescence many-flowered, spike or capitates 17
 13. Lateral sepals conjoined at upper margins to form synsepalum 14
 13. Lateral sepal not conjoined to form synsepalum 15
 14. Dorsal sepal acute at apex; lateral sepals 9.0–10.5 mm long **B. scabratum**
 14. Dorsal sepal obtuse at apex; lateral sepals 15–20 mm long **B. retusiusculum**
 15. Pseudobulbs c. 6 cm long, smooth; flowers 7–9 mm across **B. elatum**
 15. Pseudobulbs less than 6 cm long, ridged; flowers more than 9 mm across 16
 16. Flowers 1.7–2.5 cm across; lateral sepals 1.0–1.2 cm long; petals elliptic, shortly apiculate **B. guttatum**
 16. Flowers 1.2–1.7 cm across; lateral sepals 1.3–1.8 cm long; petals ovate, obtuse ... **B. umbellatum**
 17. Inflorescence a head, few-flowered (10–15), inflorescence head 18
 17. Inflorescence a spike, many-flowered (20–40), inflorescence spike 19
 18. Lateral sepals 6–7 mm long, 3–5 veined; lip with glandular dots **B. odoratissimum**
 18. Lateral sepals 10–14 mm long, 3-veined; lip without glandular dots **B. trichocephalum** var. **capitatum**
 19. Inflorescence curved **B. careyanum**
 19. Inflorescence erect 20
 20. Lateral sepals 3-veined; petals acuminate at apex; lip c. 2.5 mm long **B. manipurense**
 20. Lateral sepals 5-veined; petals acute at apex; lip c. 3.5 mm long **B. propinquum**
 21. Leaves present during flowering **B. cariniflorum**
 21. Leaves absent during flowering 22
 22. Sepals hairy on outer surface 23
 22. Sepals glabrous outside **B. triste**
 23. Lateral sepals less than 7.5–8 mm long **B. hirtum**
 23. Lateral sepals more than 25–35 mm long **B. reichenbachianum**
1. Bulbophyllum affine Lindl., Wall. Cat. 1982. 1829, *nom. nud.*, Gen. & Sp. 1830: 48; Hook.f., Fl. Brit. India 5: 756. 1890; King & Pantl, Ann. Roy. Bot. Gard. Calcutta 8: 67. t. 91. 1898. **Fig. 1a**
 Pseudobulbs 2–4 cm high, cylindric. Leaf solitary, 7–17 × 1.5–3 cm, oblong, obtuse or notched. Inflorescence 1-flowered. Flowers 2.5–3.0 cm across, yellow orange with purple stripes, glabrous. Sepals sub-equal; dorsal sepal c. 1.5 × 0.6 cm, ovate-lanceolate, acute; lateral sepals c. 1.5 × 0.5 cm, straight. Petals c. 1.4 × 0.4 cm, oblong-lanceolate, acute. Column c. 3.8 mm long, yellowish green.
Flowering: June.
Ecology: Commonly growing on moss covered tree trunks and branches of subtropical forest in association with some *Cymbidium* and *Otochilus* species.

Specimens examined: INDIA, **Manipur**, Senapati District, Willong-Khunou, 1028 m, 25° 27.959' N & 93° 56.926' E, 15.06.2011, K. Chowlu 00021 (COGCEHR)

Distribution: India (Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim), Bhutan, Cambodia, China, Japan, Laos, Myanmar, Nepal, Thailand and Vietnam.

2. ***Bulbophyllum careyanum*** (Hook.) Spreng., Syst. Veg. 3: 732. 1826; A.S. Chauhan in Pathak *et al.* (Eds.), Orchi. Sci. Comm.: 86. 2001. *Anisopetalon careyanum* Hook., Exot. Fl. 2: t. 149. 1825 ('*Anisopetalon*').

Pseudobulbs globose-ovoid, base enveloped in fibrous sheaths, borne on woody rhizome at an interval of 5.5–11 cm. Leaf solitary, elliptic-oblong, sub-acute, notched. Inflorescence spike, 10–13 cm long, curved, densely many flowered, arising from base of pseudobulb. Flowers 5–6 mm across, deep maroon. Sepals unequal, with 5 dark purple veins; dorsal sepal 4.0–4.4 × 2.5–3 mm, acute; lateral sepals 7–8 × 3 mm. Petals *c.* 2 × 1.5 mm, triangular, acute-acuminate, orange-yellow. Lip *c.* 4.5 × 2 mm, narrowly oblong-ovate, obtuse, 3-lobed. Column slightly curved, glabrous, with pointed forwardly bent arms.

Flowering: February – March.

Ecology: Abundantly distributed on moss covered tree trunk of tropical forest in association with species of *Bulbophyllum*, *Cymbidium* and some species of fern.

Specimens examined: INDIA. **Manipur**, Ukhrul District, Kasom Khullen, 23.03.1996, C. Sathish Kumar 28719 (TBGT); District Tamenglong, Tamenglong, N 24° 48.78' & E 93° 32.77', 403 m, 12.03.2011, K. Chowlu 00050; Kwatha, 24° 24.520' N & 94° 07.064' E, 402 m, K. Chowlu 00138 (COGCEHR)

Distribution: India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Uttarakhand, Uttar Pradesh, West Bengal), Bhutan, China, Myanmar, Nepal, Thailand and Vietnam.

3. ***Bulbophyllum cariniflorum*** Rchb.f. in Walp. Ann. 6: 253. 1861; Seidenf., Dansk Bot. Ark. 212. Fig. 155. 1979. *B. densiflorum* Rolfe, Bull. Misc. Inform. Kew 1892: 139. 1892. *B. viridiflorum sensu* Mehra & Kashyap, Taxon 27: 226. 1978. *B. pantlingii* Lucksom, J. Bombay Nat. Hist. Soc. 90 (3): 551. 1993 (publ. 1994). **Fig. 1b**

Pseudobulbs 2–3.7 × 1.7–2.4 cm, ovoid to obpyriform, covered with sheath fibres at base. Leaves 2, oblong-elliptic, acute, present during flowering, membranous. Inflorescence 6–8 cm, long erect, arises from the base of young pseudobulbs. Flowers 5–6 mm across, fragrant, yellowish-green. Sepals sub-equal, 3-nerved; dorsal sepal 4.5–4.6 × 2.7–3.2 mm; lateral sepals 5.5–6.0 × 2.5–3.0 mm. Petals *c.* 3 × 1.2 mm, triangular, minutely dentate at margins, one-nerved. Lip *c.* 3 × 1.8 mm, ovate-oblong, obtuse, slightly deflexed from the middle, entire at margins, orange. Column *c.* 1.5 mm long, minutely winged at margins.

Flowering: June – July.

Ecology: Rarely found growing on moss covered tree branches in subtropical forest.

Specimens examined: INDIA. **Manipur**, Ukhrul District, Kamjong, 24° 49.754' N & 94° 31.287' E, 1289 m, 16.07.2013, K. Chowlu 00381 (under cultivation in the orchidarium of COGCEHR, Hengbung, Manipur).

Distribution: India (Manipur, Meghalaya, Sikkim, Uttarakhand), Bhutan, China, Myanmar and Nepal.

4. ***Bulbophyllum elatum*** (Hook.f.) J.J. Sm., Bull. Jard. Bot. Buitenzorg, ser. 2, 8: 23. 1912. *Cirrhopetalum elatum* Hook. f., Fl. Brit. India. 5: 775. 1890 & in Oliv. (Ed.), Ic. Pl. 21: t. 2052. 1891; King & Pantl., Ann. Roy. Bot. Gard. Calcutta 8: 93, t. 130. 1898; A.S. Chauhan in Pathak *et al.* (Eds.), Orchi. Sci. & Comm. 86. 2001.

Pseudobulbs *c.* 6 cm long, cylindrical, tapering towards apex, smooth, base covered with fibrous sheaths. Leaves solitary, narrowly-oblong, obtuse, slightly notched at apex, with petiolate base. Inflorescence umbel, 25–35 cm long, densely many flowered, from base of pseudobulbs. Flowers 7–9 mm across, pale greenish-yellow. Sepals sub-equal, 5-veined; dorsal sepal 1.0–1.2 × 0.5 cm, ovate, acute, arched over the column; lateral sepals 1.5–2.0 × 0.5 cm, narrowly oblong-lanceolate, acute, curved inside along margins. Petals 3.4–3.6 × 1.5–2.0 mm, ovate-oblong, sub-acute. Lip oblong, sub-acute, decurved with a groove at base. Column *c.* 3.5 mm long, shortly winged at apex.

Flowering: June – July.

Habitat: Grows on moss covered branches in tropical forest.

Distribution: India (Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, West Bengal), Bhutan, China, Nepal and Vietnam.

Note: Sathish Kumar & Suresh Kumar (2005) reported this species as under cultivation in Thoubal district of Manipur.

5. *Bulbophyllum guttulatum* (Hook.f.) N.P. Balakr., J. Bombay Nat. Hist. Soc. 67: 66. 1970; Shukla & Baishya, J. Bombay Nat. Hist. Soc. 76. 227. 1979; Garay *et al.*, Nord J. Bot. 14 (6): 631. 1994. *B. umbellatum sensu* Lindl., Bot. Reg. 31: t. 44. 1845, *non* Lindl. 1830. *Cirrhopetalum guttulatum* Hook.f., Fl. Brit. India 5: 776. 1890.

Pseudobulbs ovoid, tapering towards apex. Leaves solitary, oblong-elliptic, acute, notched at apex, petiolate. Inflorescence umbel, erect, from base of pseudobulb. Flowers 1.7–2.5 cm across, pale yellow with purple spots. Sepals sub-equal; dorsal sepal 0.8–1.0 × 0.5–0.7 cm, oblong-ovate, acute, arched over column; lateral sepals 1.0–1.2 × 0.5–0.6 cm, ovate-lanceolate, acute, minutely falcate, incurved along margins. Petals *c.* 0.5 × 0.3 mm, elliptic, shortly apiculate. Lip 3.0–3.5 × 2.5–3.5 mm, oblong with broad base, much deflexed from middle, keeled at base. Column *c.* 3.5 mm long, stout, winged at apex.

Flowering: July – September.

Ecology: Grows on moss covered branches in tropical forests at an elevation of 1500 m in association with some species of *Coelogyne*, *Dendrobium* and *Pholidota*.

Distribution: India (Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, West Bengal), Bhutan, China, Myanmar, Nepal, Vietnam.

Specimens examined: INDIA, **Manipur**, Tamenglong District, Tipaimukh, 1350 m.

6. *Bulbophyllum hirtum* (Sm.) Lindl., Gen. Sp. Orchi. Pl. 51. 1830. *B. suave* Griff., Not. Pl. Asiat. 3: 292. 1851

Fig 1c, 2a

Pseudobulbs ovate-cylindric, slightly ridged. Leaves 2, oblong-lanceolate, sub-acute, absent during flowering. Inflorescence racemose, arising from base of pseudobulb. Flowers 5–7 mm across, fragrant, white with yellow-orange lip. Sepals sub-equal, hairy externally, white with green tinge at base, with scattered black spots at margins; dorsal sepal 7.0–7.5 × 2.0–2.4 mm, ovate-lanceolate, acuminate, concave; lateral sepals 7.5–8.0 × 3.0–

3.2 mm, oblong-lanceolate, acuminate, minutely falcate. Petals 2.2–2.5 × 1.0–1.2 mm, ovate, obtuse, ciliolate at margins. Lip 4.5–4.7 × 1.4–1.6 mm, narrowly oblong, minutely notched at apex, yellow-orange, emarginate. Column white with green tinge at apex.

Flowering: November – December.

Ecology: Found growing in tropical forest on moss covered branches in association with some ferns and species of *Bulbophyllum*, *Dendrobium* and *Pholidota*.

Specimens examined: INDIA, **Manipur**, Senapati District, Hengbung, 25° 13.82 N' & 94° 00.21 E', 1168 m, 12.11.2012, K. Chowlu 00020 (COGCEHR)

Distribution: India (Manipur, Meghalaya, Sikkim, Uttar Pradesh, West Bengal), China, Myanmar, Nepal, Thailand, Vietnam.

7. *Bulbophyllum khasyanum* Griff., Not. Pl. Asiat. 3: 284. 1851. *B. cylindraceum* Lindl. var. *khasyanum* Hook.f., Fl. Brit. India 5: 765. 1890. *B. cylindraceum sensu* King & Pantl., Ann. Roy. Bot. Gard. Calcutta 8: 70. t. 96. 1898, *non* Lindl. 1830.

Pseudobulbs absent. Leaf solitary, oblong-lanceolate, obtuse, tapering towards long petiolate base. Inflorescence 15–30 cm long, spike, 30–40-flowered. Flowers 4–5 mm across, reddish purple. Sepals unequal; dorsal sepal 3.4–3.8 × 2–3 mm, lanceolate, acute; lateral sepals 3.6–4.0 × 1.5–2.0 mm, oblong-ovate, acute. Petals 1.5–2.0 × 1.0–1.1 mm, ovate-lanceolate, acute, minutely denticulate. Lip *c.* 2.7 × 1 mm, oblong, obtuse, decurved. Column *c.* 1 mm long, erect; foot curved, pale yellow.

Flowering: November – December.

Ecology: Grows on the branches of the moss covered tree in subtropical forest.

Distribution: India (Arunachal Pradesh, Manipur, Meghalaya, Sikkim, West Bengal), China, Thailand and Vietnam.

Note: Sathish Kumar & Suresh Kumar (2005) reported this species from Manipur.

8. *Bulbophyllum leopardinum* (Wall.) Lindl., Gen. Sp. Orchi. 48. 1830; A.S. Chauhan in Pathak *et al.* (Eds.), Orchi. Sci. & Comm. 86. 2001. *Dendrobium leopardinum* Wall., Tent. Fl. Nepal. 1: 39. t. 28. 1824.

Pseudobulbs cylindric-ovoid, compressed, covered with sheaths. Leaves solitary, elliptic-oblong,

obtuse. Inflorescence 1.5–2.8 cm long. Flowers solitary, 1.2–1.5 cm across, pale yellow with scarlet spots. Sepals sub-equal, fleshy; dorsal sepal 1.5–1.8 × 1.0–1.2 cm, ovate-lanceolate, sub-acute, concave; lateral sepals 2.0–2.2 × 1.0–1.2 cm, oblong-ovate, acute. Petals *c.* 1 × 0.8 mm, oblong, acute. Lip 1.4–1.6 × 0.7–0.8 cm, ovate-lanceolate, obtuse, pale white. Column *c.* 0.7 cm long, winged at margins, yellow.

Flowering: July – August.

Ecology: Grows in tropical forests on moss covered branches in association with some ferns and species of *Pholidota* and some ferns.

Distribution: India (Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, West Bengal), Bhutan, China, Laos, Myanmar, Nepal, Thailand and Vietnam.

Note: We have mentioned this species as it is being reported by Sathish Kumar & Suresh Kumar (2005).

9. *Bulbophyllum lobbii* Lindl., Edwards's Bot. Reg. 33: sub t. 29. 1847; Kataki *et al.*, Threat. End. Orch. Northeast India 10. 1984; A.S. Chauhan in Pathak *et al.* (Eds.), Orchi. Sci. & Comm. 86. 2001.

Pseudobulbs ovoid-lanceolate, base covered with fibrous sheaths. Leaves 10–13 × 1.8–2.3 cm, narrowly oblong, acute. Flowers 5–7 cm across, solitary, yellow with purple nerves. Sepals sub-equal, 2.1–2.4 × 0.8–1.2 cm, oblong-lanceolate, acute, concave at base and falcate. Petals 2.1–2.4 × 0.7–0.8 oblong, acute. Lip broadly ovate, obtuse. Column with column foot.

Flowering: August – September.

Ecology: Grows on the branches of moss covered tress in subtropical forest.

Distribution: India (Manipur, Mizoram), Bangladesh, Cambodia, Indonesia, Myanmar, Thailand, Malaysia and Philippines.

Note: We were not able to collect this species during our field trips. This is included here on the basis of report by Sathish Kumar & Suresh Kumar (2005).

10. *Bulbophyllum manipurense* Sathish & Suresh, Rheedia 15 (1): 12. 2005. **Fig. 2b**

Pseudobulbs ellipsoid, base enveloped in sheath fibres. Leaf solitary, oblong, obtuse, notched at apex. Inflorescence cylindrical, densely many

flowered. Flowers 5–6 mm across, reddish brown. Sepals unequal; dorsal sepal 3.4–4 × 2.0–2.1 mm, oblong-ovate, obtuse; lateral sepals 4.6–5 × 2.5–3.0 mm, veins 3, elliptic-ovate, acute, boat-shaped. Petals *c.* 2 × 1.5 mm, triangular ovate, acuminate, margin erose. Lip 2.5 × 2.0–2.3 mm, oblong, obtuse, fleshy, 3-lobed. Column *c.* 2 mm long.

Flowering: February – April.

Ecology: Grows abundantly on moss covered trunk and rocky cliffs in association with some species of *Coelogyne*, *Bulbophyllum*, *Pholidota* and some ferns in sub-tropical forest.

Specimen examined: INDIA. **Manipur**, Nralum, Senapati District, 1526m, 25° 23.582 N' & 94° 00.057 E', 06.02.2013, K. Chowlu 00332 (COGCEHR)

Distribution: India (Manipur).

11. *Bulbophyllum moniliforme* Parish & Rchb.f., Trans. Linn. Soc. London 30: 151. 1874; Hook.f., Fl. Brit. India. 5: 757. 1890; Seidenf., Dansk Bot. Ark. 33 (3): 49. 1979; A.S. Chauhan in Pathak *et al.* (Eds.), Orchi. Sci. & Comm. 86. 2001.

Pseudobulbs slightly oblique, glossy. Leaves fall off during flowering. Inflorescence *c.* 1 cm long, 1-flowered. Flower *c.* 1 cm long, 7–9 mm across, yellow with brownish-orange stripes. Sepals sub-equal, thin, oblong-lanceolate, acute, 5-nerved; dorsal sepal 3.5–3.9 × 2.0–2.3 mm; lateral sepal 3.7–4.5 mm. Petals *c.* 1 × 0.4 mm, 1-nerved. Lip *c.* 2.5 × 1.5 mm, with blunt nose, red, sides forming a brim of equal width nearly to the apex.

Flowering: March.

Ecology: Grows on the branches of moss covered tropical forest.

Distribution: India (Assam, Manipur, Meghalaya, Mizoram), Cambodia, Laos, Myanmar, Thailand and Vietnam.

Note: During our field trips we have not collected this species so far. This is included here based on the report by Sathish Kumar & Suresh Kumar (2005).

12. *Bulbophyllum odoratissimum* (J.E. Sm.) Lindl., Gen. Sp. Orchi. 55. 1830; Hook.f., Fl. Brit. India 5: 758. 1890; King & Pantling, Ann. Roy. Bot. Gard. Culcutta 8: 79, t. 109.1898; Seidenf., Dansk Bot. Ark. 33 (3): 76. 1979; *Stelis odoratissima* J.E. Sm. in Rees, Cyclop 34: 12. 1814.

Pseudobulbs cylindrical, erect, glabrous, obscurely ribbed. Leaf solitary, oblong, acute, notched, tapering towards base into 1.0–1.5 cm long petiole. Inflorescence 8–14 cm long, densely many flowered. Flowers 5–7 mm across, white with bright orange-yellow, fragrant. Sepals oblong-lanceolate, sub-acute, margins inside; dorsal sepal 4.8–5.3 × 2 mm; lateral sepals 6.0–7 × 1.5–2.0 mm, 3–5-veined. Petals 1.3–1.5 × 0.5–0.6 mm, ovate, acute, white. Lip 4–5 × 2–2.1 mm, oblong-ovate, sub-acute, orange-yellow, with glandular dots. Column *c.* 1 mm long, white, glabrous.

Flowering: May.

Ecology: Grows on moss covered trunk and rocky mountains in association with some species of *Coelogyne*, *Dendrobium*, *Pholidota* and some ferns in tropical forest.

Specimen examined: INDIA. **Manipur**, Senapati District, 1298 m, 25° 13.71' N and 94° 00.12' E 23.05.2012, K. Chowlu 00221 (COGCEHR)

Distribution: India (Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim), Cambodia, China, Laos, Myanmar, Nepal, Thailand and Vietnam.

13. *Bulbophyllum polyrrhizum* Lindl., Gen. Sp. Orchi. Pl. 53. 1830; *Phyllorchis polyrrhiza* (Lindl.) Kuntze, Revis. Gen. Pl. 2: 677. 1891 **Fig. 1d, 2c**

Pseudobulbs close together, globular-ovoid. Leaf absent during flowering. Inflorescence arising from base of pseudobulbs, erect. Flowers *c.* 8 mm across, yellowish green, partially opening. Sepals sub-equal; dorsal sepal 5.0–5.3 × 2.0–2.5 mm, ovate, concave, acute, 3-veined; lateral sepals 5.0–5.5 × 2.1–2.5 mm, oblong-lanceolate, acute. Petals *c.* 2 × 1 mm, triangular, acute, 1-veined. Lip 3.5–3.7 × 1.5–1.7 mm, oblong, deflexed from base, entire. Column 2.5–3.0 mm long including the column foot, yellow.

Flowering: April.

Ecology: Commonly found growing on moss covered tree trunk and branches in association with species of *Coelogyne*, *Bulbophyllum*, *Pholidota* and some ferns in tropical forest.

Specimen examined: INDIA. **Manipur**, Kamjong, Ukhrul District, 1480 m, 24° 53.733' N & 94° 29.531' E; 04.04.2011, K. Chowlu 00019 (COGCEHR)

Distribution: India (Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim, West Bengal,

Himachal Pradesh, Uttarakhand), Bhutan, Myanmar, Nepal and Thailand.

14. *Bulbophyllum propinquum* Krzl., Orchi. 2: 62. 1908; Seidenf., Dansk Bot. Ark. 33 (3): 23. 1979.

Pseudobulbs ellipsoid to conical, green. Leaves solitary, oblong, obtuse, apex bilobed. Inflorescence *c.* 4 cm long, pale green, arising from the pseudobulbs. Flowers 5–7 mm across, reddish brown, Sepals sub-equal, 5-veined, with glandular dots; dorsal sepal 4.5–4.6 × 3.0–3.2 mm, obtuse at apex; lateral sepal 6.5–6.7 × 3.5–4.0 mm, 5 vein. Petals 1–1.5 × 2.0–2.3 mm, triangular, acute, broader than long. Lip 3.5–4.0 × 2.0 mm, fleshy, oblong, obtuse, papillose on the disc. Column 2.3–2.5 cm long.

Flowering: February – March.

Ecology: Found growing on the moss covered tree trunks in subtropical forest.

Specimen examined: INDIA. **Manipur**, Kasom Khullen, Ukhrul District, Sathish Kumar 28755 (TBGT).

Distribution: India (Manipur) and Thailand.

15. *Bulbophyllum reichenbachianum* Krzl., Bot. Jahrb. Syst. 17: 49. 1893; Garay *et al.*, Nordic. J. Bot. 14 (6): 627. 1994. *Bulbophyllum mannii* Rchb.f., Flora 55: 275. 1872, non Hook.f. 1864, *Cirrhopetalum mannii* Mukerjee (Rchb.f.), Notes Roy. Bot. Gard. Edinburgh 21 (3): 151. 1953.

Pseudobulbs ovoid. Leaves 2. Inflorescence raceme, filiform. Flowers minute, sub-globose. Dorsal sepal 0.7–1.0 cm, oblong, acute; lateral sepals 2.5–3.5 × 2.0–2.2 cm, oblong-lanceolate, acuminate, 3-nerved. Petals *c.* 0.8–1.0 cm, linear, obtuse, 1-nerved. Lip 0.9–1.1 cm long, oblong-lanceolate, obtuse, subsessile. Column *c.* 1.5 cm long; column foot 0.5 cm long.

Flowering: February.

Ecology: Found growing on moss covered tree trunk in semishady areas exposed to semi sunlight in subtropical forest.

Distribution: India (Arunachal Pradesh, Manipur), Myanmar.

Note: We have not collected this species but Sathish Kumar & Suresh Kumar (2005) reported this species as under cultivation in Ukhrul district (1500 m) of Manipur.

16. *Bulbophyllum reptans* (Lindl.) Lindl., Gen. Sp. Orchi. 51. 1830; Chauhan in Pathak *et al.* (Eds.), Orchids. Sci. & Comm. 86. 2001. *Tribrachia reptans* Lindl., Coll. Bot. t. 41 a. 1826.

Pseudobulbs distant on rhizome, obpyriform, glossy, base covering with sheath fibres. Leaf solitary, present during flowering, linear-lanceolate, acute. Inflorescence raceme, 1 or 2 per pseudobulb, 5–8 cm long, sub-erect. Flowers 0.8–1.0 cm across, yellowish-green. Sepals sub-equal, 3-nerved, spreading; dorsal sepal 8–9 × 2.0–2.5 mm; lateral sepals 9–11 × 2.5–3.0 mm. Petals 3.0–3.5 × 1.0–1.5 mm, oblong, obtuse, 1-nerved. Lip 3–4 × 1.2 mm, green with pink base. Column 1.5–2.0 mm long.

Flowering: January – February.

Ecology: Found growing commonly on moss covered tree trunk of tropical forest in association with *Bulbophyllum*, *Coelogyne* and ferns.

Specimen examined: INDIA, **Manipur**, Nepali, Senapati District, 28.02.2011, K. Chowlu 00212, 00213 (COGCEHR)

Distribution: India (Arunachal Pradesh, Manipur, Meghalaya, Sikkim, Himachal Pradesh), Myanmar, China, Nepal, Thailand and Vietnam.

17. *Bulbophyllum retusiusculum* Rchb.f. Gard. Chron. 1182. 1869; *Cirrhopetalum wallichii* Lindl., Gen. Sp. Orchi. 59. 1830; Hook.f., Fl. Brit. India 5: 776. 1890; King & Pantl, Ann. Roy. Bot. Gard. Calcutta 8: 88. t. 121. 1898 (*non* Lindl., 1839). *Bulbophyllum wallichii auct. non* Rchb.f. Tuyama in Hara, Fl. E. Himalaya. 1: 428. 1966 **Fig. 1e**

Pseudobulbs distant, ovoid, one-leaved. Leaf oblong-lanceolate, notched at apex. Inflorescence 6–9-flowered, 5–9 cm long. Flowers *c.* 2.5 cm broad, 5 cm long, brownish violet. Sepals sub-equal; dorsal sepal *c.* 0.4 × 0.2 cm, oblong-ovate, obtuse, brownish violet; lateral sepals 1.5–2.0 × 0.4–0.7 cm, ovate-oblong, obtuse, connate in middle, brownish maroon. Petals *c.* 0.3 × 0.17 cm, broadly linear-elliptic, acute, brownish-maroon. Lip *c.* 0.2 × 0.1 cm, greenish brownish, oblong-obtuse, recurved. Column brownish purple.

Flowering: August.

Ecology: Found growing on the branches of tree of moss covered subtropical forest.

Specimen examined: INDIA, **Manipur**, Willong Khunou, Senapati District, 1028 m, 25° 27.959'

N & 93° 56.926' E, 12.08.2012. K. Chowlu 00018 (COGCEHR)

Distribution: India (Manipur, Sikkim, West Bengal, Nagaland), Cambodia, China, Malaysia, Nepal, Thailand, Bhutan, Myanmar, Laos, Taiwan and Vietnam.

18. *Bulbophyllum rufinum* Rchb.f. Xenia. Orchi. f., 3: 44, t. 219.1881 **Fig. 1f, 2d**

Pseudobulbs ovoid-ellipsoid, tapering towards apex, glabrous or ribbed. Leaf solitary, oblong, obtuse with minutely notched tip. Inflorescence raceme, 12–25 cm long, longer than the leaves. Flowers 3–4 mm across, orange yellow, glabrous. Sepals unequal, glabrous, orange-yellow; dorsal sepal 4.0–4.5 × 2.0–2.5 mm, ovate-elliptic, acute, hooded over the column; lateral sepals 7–8 × 2.4–3.0 mm, ovate-lanceolate, acuminate, falcate. Petals *c.* 4 × 2.5 mm, ovate-triangular, acuminate, pale yellow. Lip 4.0–5.0 × 1.5–2.0 mm, dark orange, oblong, auricles present, 3-lobed. Column *c.* 3 mm long, curved, greenish-yellow.

Flowering: September – October.

Ecology: Found growing on main mossy tree trunks dense subtropical forest. This species is found to be very rare in distribution.

Specimen examined: INDIA, **Manipur**, Hengbung, Senapati District, 1298 m 25° 13.71' N and 94° 00.12' E, 22.11.2012, K. Chowlu 00014 (COGCEHR)

Distribution: India (Manipur), Cambodia, China, Laos, Myanmar, Thailand and Vietnam.

19. *Bulbophyllum scabratum* Rchb.f. in W.G. Walpers, Ann. Bot. Syst. 6: 256. 1861. *Cirrhopetalum caespitosum* Wall. ex Lindl, Bot. Reg. 24: misc. 35, no. 53. 1838. *Bulbophyllum confertum* Hook.f., Fl. Brit. India 5 (2): 757. 1890; Icon. Pl. 21: pl. 2035. 1890 **Fig. 1g**

Pseudobulb ovoid, broader at base, cespitose, base enveloped with sheaths. Leaf solitary, linear-lanceolate, acute. Inflorescence umbel, 3.0–4.5 cm long, erect, from the base of the pseudobulb. Flower 1.1–1.3 cm across, yellow, glabrous. Sepal sub-equal, yellow, 3-nerved; dorsal sepal 5–6 × 3–3.5 mm, ovate-lanceolate, acute; lateral sepals 9.0–10.5 × 2.5–3.0 mm, linear-lanceolate, acuminate, minutely falcate. Petals 4.5–4.8 × 2 mm, ovate-lanceolate, acute, margin dentate. Lip *c.* 3 × 1.5 mm, triangular-oblong, acute to sub-acute, entire, concave at base. Column *c.* 1 mm long, stout, foot *c.* 1.2 mm long, much curved.

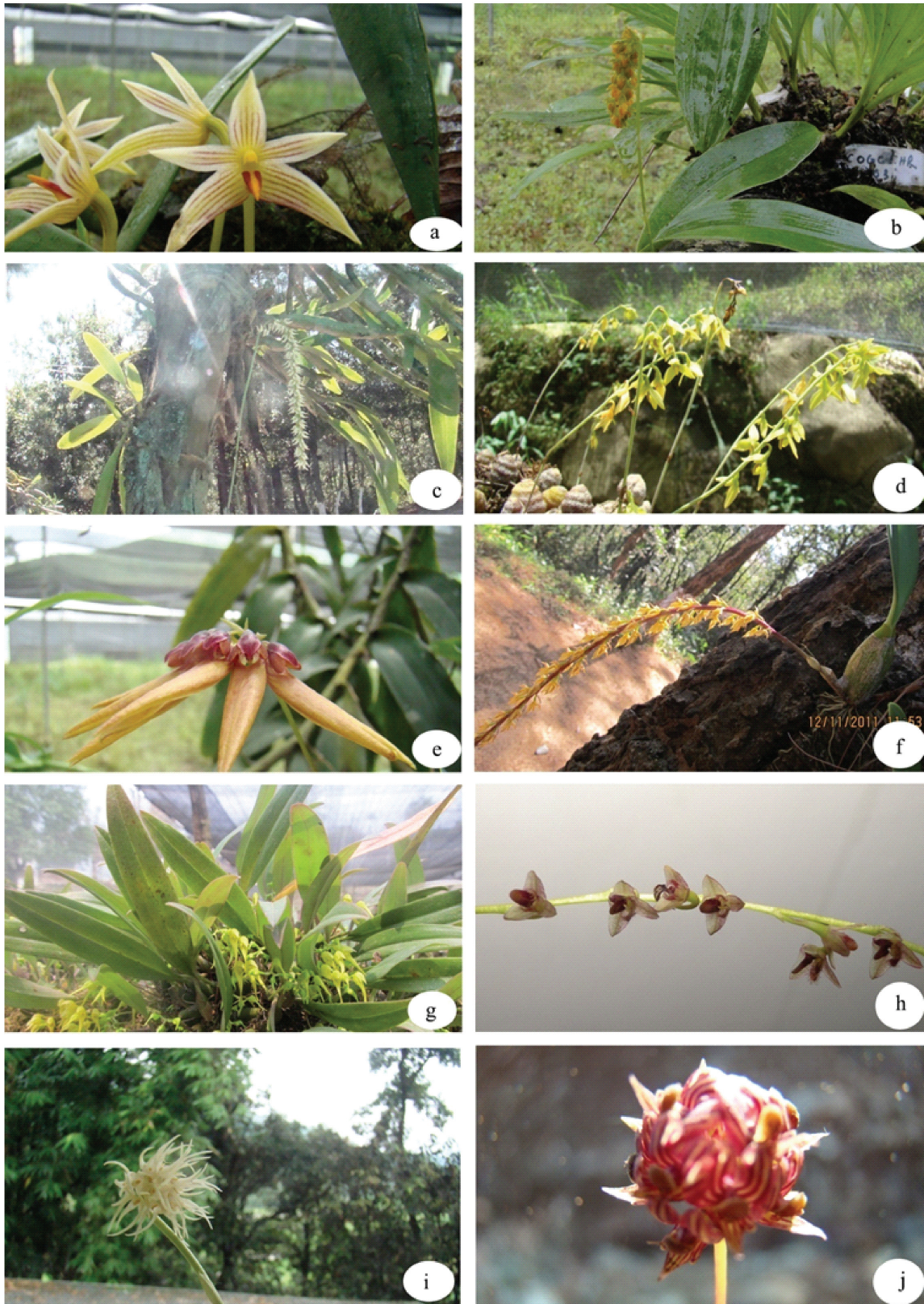


Fig. 1. a. *Bulbophyllum affine* Lindl.; b. *B. cariniflorum* Rchb.f.; c. *B. hirtum* (J.E. Sm.) Lindl.; d. *B. polyrhizum* Lindl.; e. *B. retusiusculum* Rchb.f.; f. *B. rufinum* Rchb.f.; g. *B. scabratum* Rchb.f.; h. *B. secundum* Hook.f.; i. *B. trichocephalum* (Schltr.) Lucksom var. *capitatum* Lucksom; j. *B. xylophyllum* C.S.P. Parish & Rchb.f.

Flowering: April.

Ecology: Found growing on the moss covered branches of trees in subtropical forest.

Specimen examined: INDIA, **Manipur**, Tamenglong District, 1303 m, 25° 00.80' N & 93° 32.62' E, 15.04.2011, K. Chowlu 00145 (COGCEHR)

Distribution: India (Arunachal Pradesh, Assam, Manipur, Meghalaya, West Bengal, Uttarakhand), China, Nepal, Bangladesh, Bhutan, Thailand and Vietnam.

20. *Bulbophyllum secundum* Hook.f., Fl. Brit. India 5 (2): 764. 1890; *Phyllorchis secunda* (Hook.f.) Kuntze, Revis. Gen. Pl. 2: 678. 1891.

Pseudobulbs broader than long, compressed, turbinate, very crowded. Leaf solitary, narrowly oblong, sub-acute, tapering towards petiole. Inflorescence 7–12 cm long, raceme, erect, from the base of the pseudobulb, upto 13 flowers in one inflorescence, laxly arranged. Flowers 4.8–5.0 mm across, creamy purple. Sepals sub-equal, spreading; dorsal sepal 2.4–2.7 × 1.5–1.6 mm, ovate, acute, single, ciliate margin; lateral sepals 2.5–2.7 × 1.5–1.9 mm, triangular-ovate, acute, minutely falcate. Petals 1.5–1.8 × 0.6–0.9 mm, narrowly elliptic-oblong, sub-acute, concave with upper surface ciliolate. Lip 5–6.8 × 0.6–0.9 mm, oblong, obtuse, margin hairy edges. Column c. 1 mm long, glabrous, pale yellow; column foot 1 mm long.

Flowering: June – August.

Ecology: Found growing on the branches of trees in shady areas of subtropical forest. Common.

Specimen examined: INDIA, **Manipur**, Sadim, Senapati District, 1512 m, 25° 22.294' N & 94° 02.547' E, 22.06.2012, K. Chowlu 00107 (COGCEHR)

Distribution: India (Arunachal Pradesh, Manipur, Nagaland, Sikkim), Bhutan, China, Laos, Myanmar, Thailand and Vietnam.

21. *Bulbophyllum triste* Rchb.f., W.G. Walp. Ann. 6: 253. 1861; Chauhan in Pathak *et al.* (Eds.), Orchi. Sci. & Comm. 86. 2001.

Pseudobulbs ovoid, flattened. Leaves two, narrowly oblong, acute, absent during flowering. Inflorescence erect, terete, glabrous. Flowers 3–4 mm across, dark maroon. Sepals sub-equal, ovate-oblong, acute; glabrous. dorsal sepal 2.5–3.0 × 1.1–1.5 mm; lateral sepals 4.0–4.5 × 1.4–1.7 mm. Petals

c. 1.5 × 1.2 mm, ovate-oblong, acute, 1-nerved. Lip c. 2.4 × 1.5 mm, oblong-lanceolate, obtuse, broad at base. Column 1.5–1.7 mm long, much curved; column foot 0.7–0.9 mm long.

Flowering: April – May.

Ecology: Found growing on moss covered main tree trunks in subtropical forest. Very rare in distribution.

Specimen examined: INDIA, **Manipur**, Kamjong, Ukhrul District, 1480m, 24° 53.733' N & 94° 29.531' E, 12.05.2011, K. Chowlu 00052 (COGCEHR)

Distribution: India (Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Sikkim, Uttarakhand, West Bengal), Nepal, Bhutan, Myanmar and Thailand.

22. *Bulbophyllum trichocephalum* (Schltr.) Tang & Wang var. **capitatum** Lucksom, Orchi. Sikkim & N E Himalaya 695 t. 425. Pl. 31. 2007 **Fig. 1i**

Pseudobulbs 30–40 × 5–7 mm, one-leaved. Leaf 7–9.5 × 1.5–1.8 cm. Inflorescence 9–13 cm long, capitate, from the base of the pseudobulbs. Peduncle with 2–3 bracts. Flowers c. 9 mm across, creamy, fragrant. Floral bract c. 1.2 × 2.5 mm, acute, 1 mid vein. Dorsal sepal c. 9–10 × 2 mm, acute apex. Lateral sepal 10–14 mm long, acuminate at apex, 3-veined. Petals 2 × 1 mm, triangular, acute, translucent. Lip c. 2 × 1 mm, triangular, acute, orange. Column c. 1 × 0.5 mm, very short.

Flowering: August.

Ecology: Grows in the branches of mossy trees of subtropical forest. Common.

Specimens examined: INDIA, **Manipur**, Kamjong, Ukhrul District, 1460 m, 24° 50.573' N & 94° 30.875' E, 20.09.2011, K. Chowlu 00017, 00040, 00041 (COGCEHR)

Distribution: India (Sikkim, Manipur, Meghalaya), Bhutan, Myanmar, Cambodia, China, Laos, Nepal and Thailand.

Note: In Flora of China (2009) this species has been treated as a synonym of *B. odoratissimum*. However, considering the distinct longer and caudate lateral sepals, we have followed Seidenfaden (1979) in treating this species as distinct from *B. odoratissimum* (Sm.) Lindl.

23. *Bulbophyllum umbellatum* Wall. Lindl. Gen. Sp. Orchi. 56. 1830; A.S. Chauhan in Pathak *et al.* (Ed.) Orchi. Sci. & Comm. 86. 2001. *Cirrhopetalum*



Fig. 2. **a.** *Bulbophyllum hirtum* (J.E. Smith) Lindl.: A. Plant; B. Floral bract; C. Flower; D. Dorsal sepal; E. Lateral sepal; F. Petal; G. Lip front view; H. Lip side view; I. Column; J. Anther cap; K. Pollinia; **b.** *B. manipurens* Sathish & Suresh: A. Plant; B. Bract; C. Flower; D. Dissected parts; E. Lip front view; F. Lip side view; G. Column; H. Anther cap; I. Pollinia; **c.** *B. polyrhizum* Lindl.: A. Plant without leaf; B. Plant with leaf; C. Bract; D. Flower; E. Dorsal sepal; F. Lateral sepal; G. Petal; H. Lip front view; I. Lip side view; J. Column; K. Anther cap; I. Pollinia; **d.** *B. rufinum* Rchb.f.: A. Plant; B. Flower; C. Floral bract; D. Dissected parts; E. Lip; F. Column; G. Anther cap; H. Pollinia.

maculosum Lindl. Bot. Reg. 27, misc. 81. 1841; Hook. f., Fl. Brit. India 5: 776. 1890; King & Pantl., Ann. Roy. Bot. Gard. Calcutta 8: 95. t. 132. 1898.

Pseudobulbs ovoid-cylindric, tapering toward apex, many ridged, sheath fibrous. Leaf solitary, narrowly oblong, notched apex, petiolate. Inflorescence 6–12 cm long, umbel, smooth, arising from the base of pseudobulb. Flowers 1.2–1.7 cm across, pale yellow-creamy with reddish purple spots. Sepals unequal, 5-nerved; dorsal sepal 8–9 × 4–5 mm, oblong-ovate, acute, concave; lateral sepals 13–18 × 5–6 mm, ovate-lanceolate, acute, minutely falcate. Petals c. 6 × 4 mm, ovate-oblong, obtuse. Lip 5–6 × 3 mm, oblong, obtuse, deflexed, green. Column c. 2 mm long, winged; column foot c. 6 mm long.

Flowering: March – April.

Ecology: Commonly found growing on the moss covered branches of trees in subtropical forest in association with *Coelogyne*, *Pholidota*, *Dendrobium* and some ferns.

Specimen examined: INDIA. **Manipur**, Laimaton, Bishnupur District, 1621 m, 24° 37.379' 10" N & 93° 42.063' E, 30.03.2012, K. Chowlu 00124 (COGCEHR)

Distribution: India (Arunachal Pradesh, Manipur, Sikkim), Bhutan and Nepal.

24. *Bulbophyllum xylophyllum* Parish & Rchb.f., in Trans. Linn. Soc. London 30: 151. 1874 **Fig. 1j**

Pseudobulbs absent. Leaf broadly elliptic or orbicular, obtuse, very thick, smooth, directly arising from the rhizome with petiole. Inflorescence 5–6 cm long, capitate, fleshy. Flowers 3–4 mm across, maroon blackish. Floral bracts very small. Sepals sub equal; dorsal sepal 2.5– 3.2 × 0.8–0.9 mm, 3-nerved, ovate-obtuse, sub-acute; lateral pairs 2.6–3.3 × 1.1–1.5 mm, broadly oblong, sub-acute, falcate. Petals c. 1.5 × 0.4 mm, oblong, acute. Lip c. 2 × 0.6 mm, oblong, obtuse. Column c. 1 mm long, dark maroon.

Flowering: January.

Ecology: Found on the moss covered branches of trees in dense tropical forest. Rare.

Specimen examined: INDIA, **Manipur**, Kwatha, Chandel District, 490 m 24° 19.5' N & 94° 13.7' E, 26.01.2011, K. Chowlu 00016 (COGCEHR)

Distribution: India (Arunachal Pradesh, Sikkim, Manipur, Meghalaya), China, Myanmar, Thailand and Vietnam.

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