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Twelve new additions in the orchid flora of Tripura, north-east India

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Abstract
Despite the discovery of several new plant species from India every year, there is dearth of information on species of orchid, especially from the North Eastern Region . As a detailed survey seemed necessary for reliable documentation, we looked into the diversity of orchids in Tripura state. We document the first records from the state for 12 species of orchids, including two genera (*Crepidium* Tausch and *Dendrolirium* Blume). Geographical distributions along with detailed descriptions and photographs of the species are provided.

Keywords
Epiphytic orchids, extended distribution, new records, terrestrial orchids.

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Introduction

With around 28,000 species globally, orchids are the largest group of flowering plants with representation in all continents except Antarctica (Chase 2015; Willis 2017). This cosmopolitan family constitutes more than 9% of the Indian flora. Since north-eastern India shares its phytogeographic affinities with the Indo-Burma biodiversity hotspot and has very high habitat heterogeneity, the area has very high biodiversity including many endemics. Tripura state is botanically poorly explored, and the documentation of its flora is incomplete. Unlike the other states of India, a dedicated orchid survey of Tripura has never been conducted. Since the compilation of Flora of Tripura (Deb 1983), forests in the region have experienced structural changes. Recently, a few botanists have realized this lacuna in the literature and lack of information on floristic diversity, especially on the orchid diversity, and have initiated floristic expeditions in the state. This has led to some new distributional records of orchids (Das and Datta 2016; Debnath et al. 2016; Panda et al. 2016). However, due to its location in the biologically rich Indo-Malayan ecozone, many orchids are still anticipated to be unreported. We document 12 orchid species which were not previously known from Tripura.

Methods

We made extensive field surveys in forested areas of Tripura, north-eastern India (Fig. 1) between January 2018 and June 2019. We conducted our study as a sweep survey and opportunistically collected species. Photographs and morphometric data of orchids were gathered along with the GPS coordinates and other relevant data. Due to their threatened status and small populations, only one orchid specimen representing each taxon was collected, pressed, and subsequently treated with formalin. This was followed

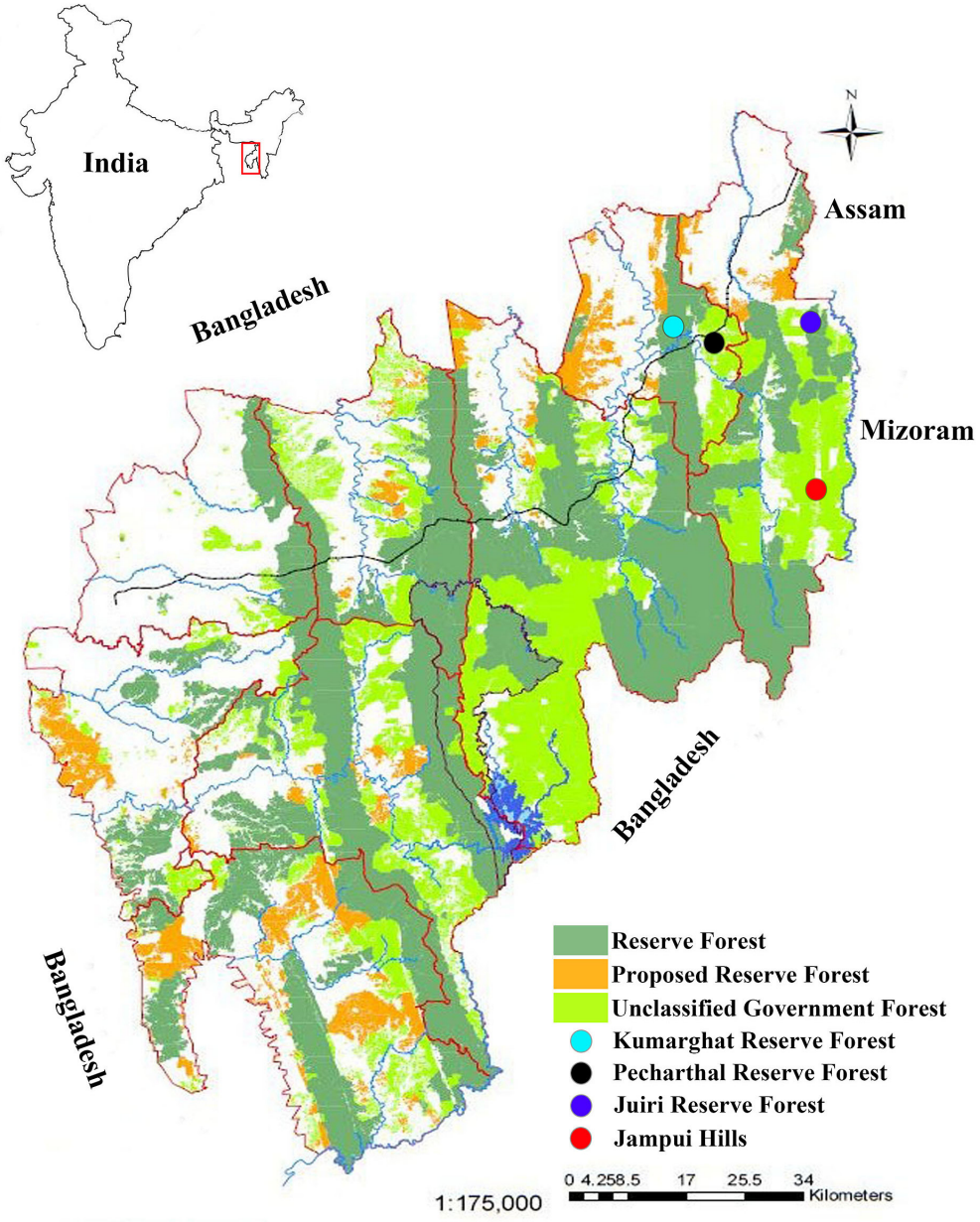

Figure 1. Map of Tripura, north-eastern India. Shaded circles correspond to sites where new orchid records were found.

by herbarium preparation using the standard method (De Vogel 1987; Bridson and Forman 1992). We obtained permits from the Forest department, Government of Tripura for both territorial areas (No.F.2-61/For/Misc/Estt-2013/23009-019) and wildlife areas (No.F.8(163)/For-WL-2016/886-87) in the state before commencing our study. Collected specimens were systematically identified using pertinent literature (Kumar and Kumar 2005; Schuiteman et al. 2008; Chen et al. 2009; Averyanov et al. 2016; Zhou et al. 2016) and were deposited in the Delhi University Herbarium (DUH), Department of Botany, University of Delhi, Delhi–110007, India. Newly collected specimens were compared online with herbarium records from Kew Herbarium Catalogue (http://apps.kew.org/herbcat/gotoHomePage.do; Kew Botanical Gardens, UK) and Swiss Orchid Foundation (https://orchid.unibas.ch/index.php/en/database-search/advanced-search; Herbarium Jany Renz).

Results

***Acampe ochracea* (Lindl.) Hochr.**

Type: India, Sikkim, 1867, J.D. Hooker s.n. (K!)

Figure 2A

Identification. Erect monopodial epiphytic herb; leaves simple with entire margin, alternately arranged, sessile, lamina 18.5–20.2 × 1.9–2.2 cm, linear with parallel venation, emarginate apex and sheathing base; inflorescence usually branched, ascending, opposite to leaves, paniculate with 30–50 flowers; flowers pedicellate, bracteate, 1.2–1.4 cm long, zygomorphic, yellow, mildly fragrant; bract triangular, fleshy, acute; sepals and petals oblanceolate with acute apex, 0.6–0.8 × 0.1 cm, yellow with scarlet striations; lip deltoid, slightly lobed, 0.2–0.3 × 0.2 cm, channeled near the base, white with purple spots; spur yellow 0.2–0.3 cm long; column scarlet, 0.1

cm long, sessile; anther cap yellow, pollinia 2, yellow.

Flowering and fruiting: December and January.

Habitat. Growing on *Tectona grandis* L.f. trees in moist deciduous forests of Pecharthal and Maharani Reserve Forest along with *Dendrobium lindleyi* Steud.

Distribution. India, Bangladesh, Bhutan, Cambodia, Laos, Myanmar, Southern China, Sri Lanka, Thailand, and Vietnam.

New record. India: Tripura: Pecharthal Reserve Forest (24°11.120′N, 092°05.821′E, 43 m elev.), Arjun Adit 2102, 10 Jan. 2018 (1 specimen, DUH 14482).

Specimens compared. Bhutan, 1862, W. Griffith 547 (K000079051). India, Sikkim, 1889, J.D. Hooker (K000 846861).

***Acampe rigida* (Buch.-Ham. ex Sm.) P.F. Hunt**

Type: Nepal, Buchanan-Hamilton Icon (LINN!)

Figure 2B

Identification. Erect monopodial epiphytic herb; leaves simple with entire margin, alternately arranged, sessile, lamina 16.4–18.2 × 1.9–2.2 cm, linear with parallel venation, emarginate apex and sheathing base; inflorescence branched, ascending, axillary, paniculate with 10–15 flowers; flowers pedicellate, bracteate, 1.8–2 cm long, zygomorphic, yellow, mildly fragrant; bract one per flower, triangular, fleshy, obtuse; sepals and petals obovate with acute apex, 0.8–1 × 0.2–0.3 cm, yellow with red horizontal stripes; lip triangular with acute apex, 0.2–0.3 × 0.2 cm, white with purple stripes, turning yellow after pollination; column scarlet, stout, 0.1 cm long, sessile; anther cap yellow, pollinia 2, yellow.

Flowering and fruiting: July and August.

Habitat. Growing on *Syzygium cumini* (L.) Skeels trees in moist deciduous forests of Juri and Maharani Reserve Forest.

Distribution. India, Bangladesh, Bhutan, Cambodia, China, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Taiwan, Thailand, and Vietnam.

New record. India: Tripura: Juiri Reserve Forest (24° 07.422′N, 092°11.689′E, 100 m elev.), Arjun Adit 2127, 26 Jul. 2018 (1 specimen, DUH 14488).

Specimen compared. Myanmar, Tavoy, 1827, W. Gomez 7322 (K001127173). Malaysia, Government Hill, 1889, C. Curtis 1963 (K000942343).

***Bulbophyllum crassipes* Hook.f.**

Type: Myanmar, Martaban, Wallich 1990 (K!)

Figure 2C

Identification. Erect epiphytic herb; rhizome sturdy, 0.3–0.5 cm in diameter; pseudobulbs erect, 6.9–7.4 cm apart, conical, 2.9–3.7 cm in length, 1.6–2.1 cm in diameter; leaf solitary with entire margin, petiole 0.7–0.9 cm long, lamina 9–12 × 2.5–3 cm, oblong with parallel venation, retuse apex and decurrent base; inflorescence originating from base of the pseudobulb, many flowered raceme, 5–6 cm long with usually 4 sheaths, peduncle stout, 2.5–3.4 cm long; flower pedicellate, bracteate, 1.3–1.6 cm long, zygomorphic, scarlet colored; bract one per flower, lanceolate, 0.4–0.6 cm long, acute, brown; sepals and petals oblong with obtuse apices, 0.5–0.6 × 0.2cm, reddish yellow; lip ligulate, papillate, fleshy with retuse apex, 0.6–0.8 × 0.3–0.4 cm, orange to scarlet in color; column slightly recurved, 0.1 cm long, sessile; anther cap orange, pollinia 2, yellow.

Flowering and fruiting: October.

Habitat. Growing on *Shorea robusta* C.F. and *Artocarpus chama* Buch.-Ham. trees in moist deciduous forests of Kumarghat and Garji Reserve Forest.

Distribution. India, Bangladesh, Bhutan, China, Laos, Malaysia, Myanmar, and Thailand.

New record. India: Tripura: Kumarghat Reserve Forest (24°10.953′N, 092°02.429′E, 24 m elev.), Arjun Adit 2129, 26 Oct. 2018 (1 specimen, DUH 14490).

Specimens compared. India, Nepalea, 1821, N. Wallich 1990 (K000829151). India, Sikkim, 1884, C.B. Clark 36904 (K000829150).

***Cleisostoma simondii* (Gagnep.) Seidenf.**

Type: Thailand, Chiengmai, 1910, A.F.G. Kerr 269 (K!)

Figure 2D

Identification. Erect or hanging epiphytic monopodial herb; non–rhizomatous; stem cylindrical, 0.4–0.7 cm in diameter; leaves terete, alternately arranged, sessile, 8–12 cm long, 0.3–0.5 cm in diameter; inflorescence axillary and drooping with 7–10 flowers; flowers pedicellate, bracteate, 1.3–1.5 cm long, zygomorphic, green and white; bract one per flower, brown, 0.1 cm long; sepals and petals oblong with obtuse apices, 0.4–0.5 × 0.2 cm, dark green with vertical purple stripes; lip obtuse with acute apex, 0.5–0.6 × 0.2–0.3 cm, two distinct purple colored lobes near the base, white, turning yellow after pollination; spur yellowish green, 0.3–0.4 cm long; column yellow, 0.1 cm long, sessile; anther cap yellow, pollinia 2, yellow.

Flowering and fruiting: October.

Habitat. Growing on *Citrus* sp. trees in orange plantations of Sabual, Jampui hills along with *Gastrochilus inconspicuus* (Hook.f.) Kuntze.

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

New record. India: Tripura: Jampui hills (Sabual) (23°52.367’ N, 92°16.0’ E, 789 m elev.), Arjun Adit 2128, 11 Sep. 2018 (1 specimen, DUH 14489).

Specimen compared. Thailand, Chiengmai, 1910, A.F.G. Kerr 269 (K000942395).

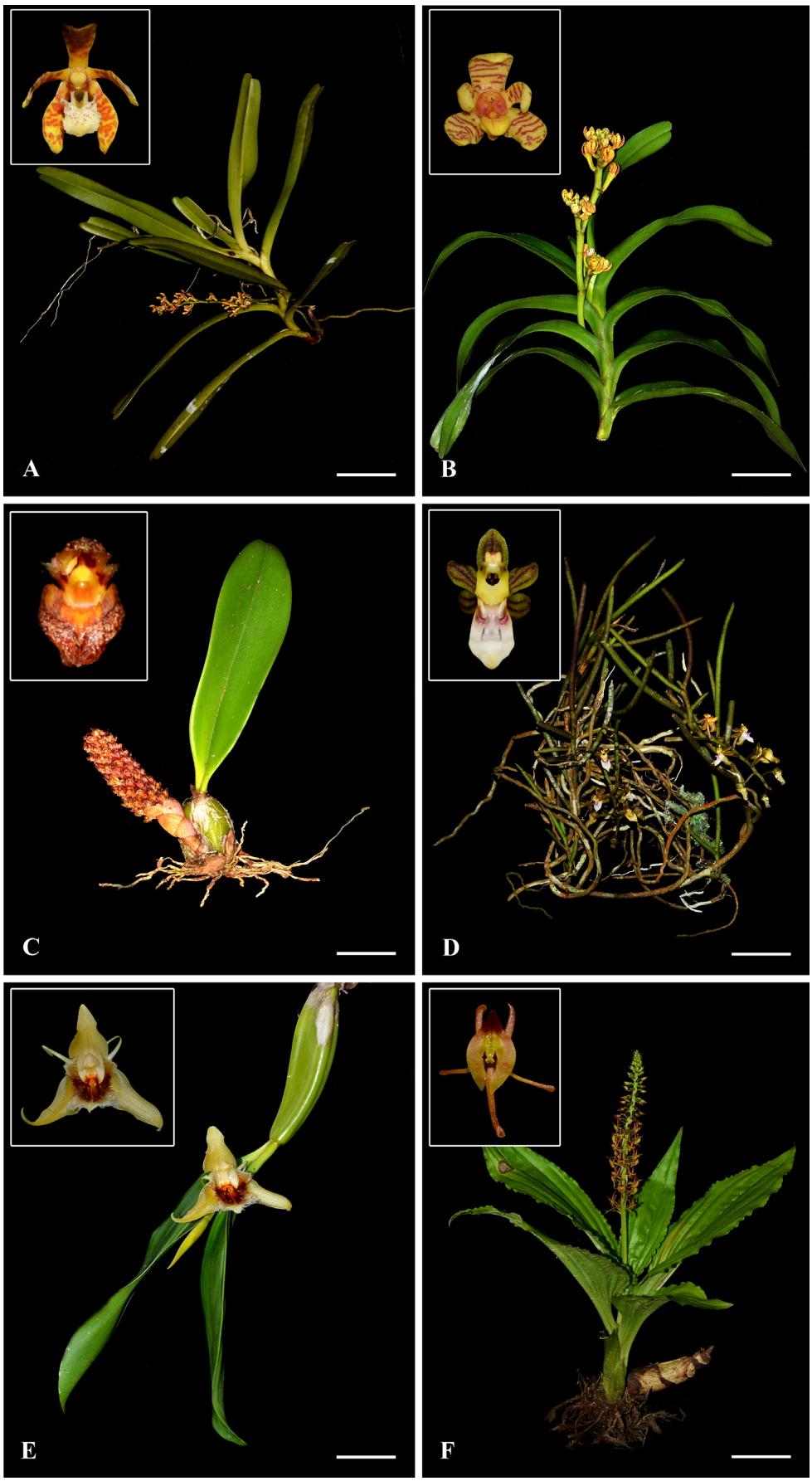

Figure 2. Selected new records for Tripura, showing plant body and flower (inset). **A.** *Acampe ochracea* (Lindl.) Hochr. **B.** *Acampe rigida* (Buch.-Ham. ex Sm.) P.F. Hunt. **C.** *Bulbophyllum crassipes* Hook.f. **D.** *Cleisostoma simondii* (Gagnep.) Seidenf. **E.** *Coelogyne fimbriata* Lindl. **F.** *Crepidium biauritum* (Lindl.) Szlach. Scale bars: A, B, F = 5 cm; C, D = 4 cm; E = 3 cm.

***Coelogyne fimbriata* Lindl.**

Type: China, 1825, s.coll. s.n. (K!)

Figure 2E

Identification. Erect epiphytic herb; rhizome creeping, 0.4–0.6 cm in diameter; pseudobulbs erect, 2.6–3.2 cm apart, cylindrical, 3.8–4.3 cm in length, 1.6–1.9 cm in diameter; leaves two, with entire margin, petiole 0.8–1.2 cm long, lamina 10.2–11.4 × 2.2–2.6 cm, oblong or lanceolate with parallel venation, acute apex and decurrent base; inflorescence heteranthous, consisting of 2 or 3 flowers in raceme; flowers pedicellate, bracteate, 3.2–4.5 cm long, zygomorphic, pale yellow; bract one per flower, caducous, brown in color; sepals oblong with acute apices, 1.8–2.3 × 0.4–0.5 cm, pale yellow; petals linear, 1.9–2.1 cm long, white; lip ovate, 3-lobed; lateral lobes erect, ovate; mid-lobe elliptic with fimbriate margins and obtuse apex, 1.3–1.7 × 0.5–0.7 cm, lip keel lamellae undulate, longitudinally arranged, maroon, two to three; column white, recurved, 0.5 cm long, sessile; anther cap pale yellow, pollinia 2, yellow.

Flowering and fruiting: January and February.

Habitat. Growing on a *Syzygium cumini* (L.) Skeels. tree in moist broadleaf forest along with *Pinalia globulifera* (Seidenf.) A.N. Rao at Phuldungsei, Jampui hills.

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

New record. India: Tripura: Jampui Hills (Phuldungsei) (23°48.835′N, 092°15.564′E, 845 m elev.), Arjun Adit 2104, 8 Jan. 2018 (1 specimen, DUH 14483).

Specimen compared. China, Hong Kong, 1825, J.G. Champion (K001089602).

***Crepidium biauritum* (Lindl.) Szlach.**

Type: India, Pundua, 1832, N. Wallich 1914 (K!)

Figure 2F

Identification. Erect terrestrial herb; rhizome underground, sturdy, prostrate; stem cylindrical, 3–4 × 0.6–0.8 cm, several nodes, base covered with sheaths; leaves simple with entire margin, sessile, alternately arranged, lamina 10–16 × 3–5 cm, elliptic with parallel venation, acuminate apex and cuneate base; inflorescences 15–20 cm long, terminal, consisting of 45–55 flowers in a raceme; flowers pedicellate, bracteate, 0.9–1.1 cm long, zygomorphic, non-resupinate; bract one per flower, lanceolate, fleshy, acute, 1.1–1.2 × 0.2 cm, green; sepals lanceolate with acuminate apices, 0.4–0.6 × 0.1 cm, maroon red; petals linear, 0.4–0.6 cm long, scarlet colored; lip semi-amplexicaul, ovate with acute apex, 0.4–0.6 × 0.2–0.3 cm, scarlet with maroon apex and yellow two-lobed and channeled centre; column purple, 0.1 cm long, subsessile; anther cap yellow, pollinia 2, cream-colored.

Flowering and fruiting: June and July.

Habitat. Growing near a seasonal waterfall in the moist broadleaf forest in Hmnpui, Jampui hills.

Distribution. India (Andaman and Nicobar Islands, Assam, Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Uttarakhand), Bangladesh, China, Laos, Myanmar, Nepal, and Thailand.

New record. India: Tripura: Jampui Hills (Hmnpui) (23°02.316′N, 092°16.307′E, 339 m elev.), Arjun Adit 2142, 10 Jun. 2019 (1 specimen, DUH 14492).

Specimens compared. India, Andamans, 1884, King 306 (K000387671). Thailand, Doi Sutep, 20 May 1912, A.F.G. Kerr 329 (K000596170).

***Dendrobium anceps* Sw.**

Type: Indian Orient, Swartz's collector s.n. (UPS-THUNB!)

Figure 3A

Identification. Erect or hanging epiphytic herb; non–rhizomatous; stem compressed, 15–30 cm in length, 0.6–1.5 cm in diameter; leaves simple with entire margin, alternately arranged, sessile, lamina 4.2–4.7 × 0.9–1.2 cm, lanceolate with parallel venation, acuminate apex; inflorescence solitary, axillary; flowers pedicellate, bracteate, 2.5–3.3 cm long, zygomorphic, yellow; bract one per flower with papery texture, transparent 0.2–0.3 × 0.1 cm ; sepals ovate with acute apices, 1.9–2.1 × 0.3–0.4 cm, entire, yellow; petals ovate with acute apices, 0.6–0.8 × 0.1 cm, entire, yellow; lip obovate, undulate, recurved in the middle, truncate apex, 1.9–2.2 × 0.4–0.5 cm, yellow; mentum yellow, 0.3–0.5 cm long; column yellow, 0.2 cm, sessile; anther cap yellow, pollinia 2, cream.

Flowering and fruiting: February and March.

Habitat. Growing on *Magnolia montana* (Blume) Figlar tree in moist broadleaf forest in Hmnpui, Jampui Hills.

Distribution. India (Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura), Bangladesh, Bhutan, Cambodia, Laos, Myanmar, Nepal, Thailand, and Vietnam.

New record. India: Tripura: Jampui Hills (Hmnpui) (23°02.316′N, 092°16.307′E, 339 m elev.), Arjun Adit 2144, 15 Feb. 2019 (1 specimen, DUH 14493).

Specimens compared. Myanmar, Chappedong, 1827, N. Wallich 2020 (K001114907). Thailand, Kanburi, 1926, A.F.G. Kerr 276 (K000596716).

***Dendrobium parishii* Rchb. f.**

Type: Myanmar, Moulmein, Parish 18 (W!)

Figure 3B

Identification. Erect or hanging epiphytic herb; non–rhizomatous; stem cylindrical, 15–30 cm in length, 0.7–1.2 cm in diameter; leaves simple with entire margin, alternately arranged, sessile, lamina 7–11 × 1.3–1.7 cm, oblong with parallel venation, acute apex and decurrent

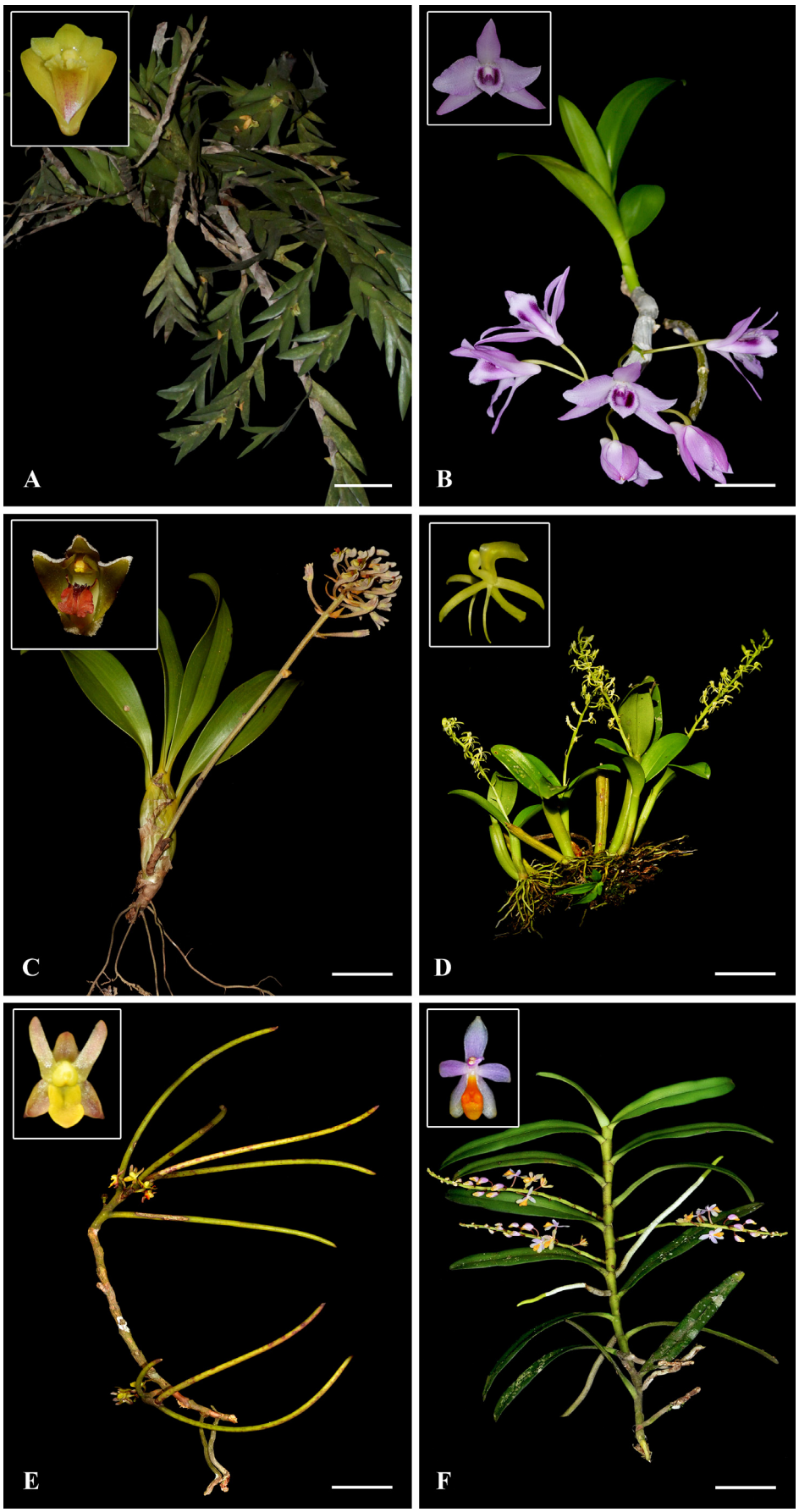

Figure 3. Selected new records for Tripura, showing plant body and flower (inset). **A.** *Dendrobium anceps* Sw. **B.** *Dendrobium parishii* Rchb. f. **C.** *Dendrolirium tomentosum* (J. Koenig) S.C. Chen & J.J. Wood. **D.** *Liparis bistriata* C.S.P. Parish & Rchb.f. **E.** *Luisia brachystachys* (Lindl.) Blume. **F.** *Micropera obtusa* (Lindl.) Tang & F.T. Wang. Scale bars: A, E = 5 cm; B, C, F = 4 cm; D = 3 cm.

base; inflorescence on old leafless stem, 6–8 flowers occurring in pairs; flowers pedicellate, bracteate, 3–5 cm long, zygomorphic, lavender colored; bract one per flower with papery texture, transparent 0.4–0.5 × 0.1 cm ; sepals and petals ovate with acute apices, 2.2–2.5 × 0.6–0.8 cm, entire, lavender; lip tubular and enclosing the column, two dark purple nectar guides on lateral portions, fimbriate at margins, acute apex, 1.8–2.1 × 1.4–1.7 cm, purplish white; mentum purple to white, 0.4–0.6 cm long; column white, 0.3 cm, sessile; anther cap purple, pollinia 2, cream.

Flowering and fruiting: May and June.

Habitat. Growing on *Mangifera sylvatica* Roxb. tree along with *Dendrobium aphyllum* (Roxb.) C.E.C. Fisch., *Dendrobium polyanthum* Wall. ex Lindl., *Dendrobium transparens* Wall. ex Lindl., and *Pinalia acervata* (Lindl.) Kuntze in Tlaksih village, Jampui Hills.

Distribution. India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura), Bangladesh, Bhutan, Cambodia, China, Laos, Myanmar, Thailand, and Vietnam.

New record. India: Tripura: Jampui Hills (Tlaksih) (24° 01.900′N, 092°16.692′E, 630 m elev.), Arjun Adit 2139, 8 May 2019 (1 specimen, DUH 14491).

Specimen compared. Myanmar, 1867, C.S.P. Parish 18 (K000943954).

***Dendrolirium tomentosum* (J. Koenig) S.C. Chen & J.J. Wood**

Type: India, 1872, Rottler s.n. (K!)

Figure 3C

Identification. Erect epiphytic herb; rhizome sturdy 0.5–0.9 cm; pseudobulbs erect, compressed, elliptic, 8–9 cm in length, 2.6–3.3 cm in diameter; leaves simple with entire margin, sessile, fleshy, lamina 12–15 × 2.2–2.8 cm, oblong with parallel venation, acute apex and sheathing base; petiole 1.5–1.8 cm; inflorescence heteranthous, originating from near the base of pseudobulb, 15–32 cm long, tomentose, ash colored, 7–8 funnel shaped basal sheaths, consisting of 18–20 flowers in a raceme; flowers pedicellate, bracteate, 3–4 cm long, zygomorphic, pubescent; bract one per flower, foliaceous, 1–1.5 × 0.3–0.4 cm, orange; sepals lanceolate with acuminate apices, 1.1–1.3 × 0.2 cm, lemon yellow; petals linear, 0.9–1.1 cm long; lip oblong, 0.8–1.2 × 0.3 cm, recurved with acute apex, lateral lobes erect, mid lobe maroon with ornamentations; mentum 0.2–0.3 cm long; column white, 0.4 cm long, sessile; anther cap lemon yellow, pollinia 8, yellow.

Flowering and fruiting: March and April.

Habitat. Growing on *Mangifera sylvatica* Roxb. tree along with *Aerides odorata* Lour. and *Dendrobium fimbriatum* Hook. in Tlaksih village, Jampui Hills.

Distribution. India (Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura), Bangladesh, China, Laos, Myanmar, Thailand, and Vietnam.

New record. India: Tripura: Jampui Hills (Tlaksih) (24° 01.900′N, 092°16.692′E, 630 m elev.), Arjun Adit 2111, 6 May 2018 (1 specimen, DUH 14484).

Specimen compared: China, Hainan, 1893, Ford 4740 (K000827415).

***Liparis bistriata* C.S.P. Parish & Rchb.f.**

Type: Myanmar, Moulmein, Parish 80 (K!)

Figure 3D

Identification. Erect epiphytic or lithophytic herb; pseudobulbs densely clustered, cylindrical, 4–5 × 0.6–0.8 cm; leaves 2, simple with entire margin, sessile, opposite on top of stem-like pseudobulb, lamina 4–6 × 1.4–1.6 cm, elliptic with parallel venation, mucronate apex and sheathing base; inflorescences 12–15 cm long, terminal, consisting of 15–20 flowers in a raceme; flowers pedicellate, bracteate, 1.1–1.3 cm long, zygomorphic, non-resupinate; bract one per flower, fleshy, acute, 0.5–0.6 × 0.1 cm, yellow; sepals oblong with obtuse apices, 0.5–0.6 × 0.1 cm, yellowish green, petals linear, 0.5–0.6 cm long, yellowish green; lip recurved at the middle, rectangular with truncate apex, 0.5–0.6 × 0.2 cm, yellow with slight depression in the centre; column yellow, 0.3–0.4 cm long, recurved, sessile; anther cap yellow, pollinia 2, cream colored.

Flowering and fruiting: July and August.

Habitat. Growing on *Cryptocarya amygdalina* Nees and *Magnolia montana* (Blume) Figlar trees in the moist broadleaf forest of Phuldungsei in Jampui Hills along with other epiphytes like *Bulbophyllum lobbii* Lindl., *Hoya lanceolata* Wall. ex D. Don, *Mycaranthes floribunda* (D. Don) S.C. Chen and *Thelasis khasiana* Hook.f.

Distribution. India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura), China, Myanmar and Thailand.

New record. India: Tripura: Jampui Hills (Phuldungsei) (23°48.617′N, 092°15.679′E, 923 m elev.), Arjun Adit 2124, 14 Jul. 2018 (1 specimen, DUH 14487).

Specimens compared. Myanmar, Moulmein, 1872, C.S.P. Parish 80 (K000387817). Thailand, Chiengmai, 1922, A.F.G. Kerr 491 (K000596241).

***Luisia brachystachys* (Lindl.) Blume**

Type: Bangladesh, 1867, N. Wallich 1994 (K!).

Figure 3E

Identification. Erect or hanging epiphytic monopodial herb; non-rhizomatous; stem cylindrical, 0.3–0.5 cm in diameter; leaves terete, alternately arranged, sessile, 15–20 cm long, 0.1–0.2 cm in diameter; inflorescence axillary with 5–8 flowers; flowers pedicellate, bracteate, 0.8–1.1 cm long, zygomorphic, reddish yellow; bract one per flower, brown, 0.2 cm long; sepals ovate with obtuse apices, 0.6–0.7 × 0.2 cm, red; petals oblong with obtuse apices, 0.5–0.6 × 0.1 cm, red; lip oblong with acute apex, 0.5–0.6 × 0.2–0.3 cm, channeled near the base, yellow;

column yellow, 0.1 cm long, sessile; anther cap yellow, pollinia 2, yellow.

Flowering and fruiting: March to May.

Habitat. Growing on *Dipterocarpus turbinatus* C.F. Gaertn. and *Artocarpus chama* Buch.-Ham. In moist deciduous forest of Kumarghat and Juiri Reserve forests and Sepahijala Wildlife Sanctuary.

Distribution. India (Arunachal Pradesh, Assam, Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Uttarakhand), Bangladesh, Bhutan, China, Laos, Myanmar, Thailand, and Vietnam.

New record. India: Tripura: Kumarghat Reserve Forest (24°10.953′N, 092°02.429′E, 24 m elev.), Arjun Adit 2118, 5 Apr. 2018 (1 specimen, DUH 14485).

Specimens compared. India, Sikkim, 1897, s.coll. 470 (K!). Thailand, Chiengmai, 1912, A.F.G. Kerr 298 (K00089 1535).

***Micropera obtusa* (Lindl.) Tang & F.T. Wang**

Type: India, 1848, G. Loddiges s.n. (K!).

Figure 3F

Identification. Terete or hanging epiphytic herb; non-rhizomatous; pseudobulb in form of stick, cylindrical, 30–40 cm in length, 0.6–0.8 cm in diameter; simple leaves with entire margin, alternately arranged, sessile, lamina 10–12 × 1.6–1.8 cm, linear with parallel venation, obtuse apex and sheathing base; inflorescence axillary and terete with 18–20 flowers; flowers pedicellate, bracteate, 1.5–1.7 cm long, zygomorphic, lavender; bract one per each flower, brown-black; sepals and petals obtuse with round apices, 0.7–0.8 × 0.2–0.3 cm, lavender; lip obtuse with bilobed obtuse apex, 0.7–0.8 × 0.2–0.3 cm, orange to yellow; spur yellow 0.1 cm long; column white, 0.1 cm long, sessile; anther cap white at head and violet on tail, pollinia 2, yellow.

Flowering and fruiting: July to September.

Habitat. Found growing on *Phanera variegata* (L.) Benth. tree along with *Pinalia acervata* (Lindl.) Kuntze on edges of the forest adjacent to Phuldungsei in Jampui Hills.

Distribution. India (Sikkim, Assam, Mizoram and Tripura), Bangladesh, Bhutan, Myanmar, Nepal, and Thailand.

New record. India: Tripura: Jampui Hills (Phuldungsei) (23°48.870′N, 092°15.558′E, 787 m elev.), Arjun Adit 2123, 26 Jul. 2018 (1 specimen, DUH 14486).

Specimen compared: India, 1848, G. Loddiges s.n. (K000974247).

Discussion

We add two genera, *Crepidium* and *Dendrolirium*, to the flora of Tripura state. The Jampui Hills have the greatest orchid diversity in the state, as first reported by Deb (1983). Our surveys were able to confirm this, and 10 out of the 12 species documented by us were from these hills. For a long time, Jampui forests have been under the protection of local tribal communities. Recently, however, areas under orange cultivation, which harbor important orchid species, are being replaced by Areca nut plantations. These plantations are ecologically damaging and require clearing of vegetation by slash and burn. Whereas areca nut plantations have resulted in loss of hosts for epiphytic species, the shifting cultivation has been the main cause for disappearance of terrestrial orchids in the region. In spite of being one of the richest floristic regions in the state Jampui is still one of the most vulnerable. Unlike the other forests in the state, none of the vegetation patches here are listed for legal protection by the government. Besides slash and burn cultivation and over-exploitation of forest resources, the area also borders neighboring states of Assam and Mizoram, making it an easy target for illegal timber extraction. In the past few years, there has been illegal felling of very old trees of *Tectona grandis*, *Schima wallichii*, and *Magnolia montana*, which are extremely important orchid hosts in the region (Sharma 2010). Therefore, we hope that our study brings attention to the dire need for conservation of Jampui forests.

Tripura is surrounded by Bangladesh on three sides and by two Indian states (Assam and Mizoram) on one side. With similar microclimatic conditions, both of the Indian states are known to harbor the 12 species found by us. However, in a recent publication by Islam et al. (2016) on the neighboring Sylhet region in Bangladesh only one of these orchid species, *Dendrobium parishii*, was enumerated. Since Sylhet lies between the three Indian states and has similar vegetation, these orchids should also be present there. Hence, we encourage dedicated orchid surveys in neighboring areas of Bangladesh in order to build a comprehensive database for South Asia.

Much of orchid flora in north-eastern India is similar to those found in Laos, Myanmar, southern China, and Vietnam (Schuiteman et al. 2008; Chen et al. 2009; Averyanov 2013; Zhou et al. 2016; Kumar et al. 2018). This pattern of distribution in the Indo-China and its extended fringes is also opined by Vuong and Sridith (2016). However, systematic exploration of orchids across Indo-Burma biodiversity hotspot is a prerequisite to establish their biogeographical affinity with the entire Indo-Malayan region. This will help in the study of eco-evolutionary trends of tropical orchids but also act as a gateway to understand intricate relationships that orchids have with other biota.

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Authors' Contributions

All the authors were part of regular field surveys. AA identified, collected, and prepared the specimens. AA, MK, and RT wrote the manuscript.

References

Averyanov LV (2013) The orchids of Vietnam illustrated survey. Part 4. Subfamily Epidendroideae (tribes Arethuseae and Malaxideae). Turczaninowia 16 (1): 5–163.

Averyanov LV, Nguyen KS, Maisak TV, Konstantinov EL, Nguyen TH, Bounphanmy S (2016) New and rare orchids (Orchidaceae) in the flora of Cambodia and Laos. Turczaninowia 19 (3): 5–58. https://doi.org/10.14258/turczaninowia.16.4.7

Bridson, D, Forman L (1992) The herbarium handbook. Royal Botanic Gardens, Kew. 346 pp. https://doi.org/10.1111/j.1756–1051.1991.tb01808.x

Chase MW, Cameron KM, Freudenstein JV, Pridgeon AM, Salazar G, van denBerg C, Schuiteman A (2015) An updated classification of Orchidaceae. Botanical Journal of Linnean Society 177 (2): 151–174. https://doi.org/10.1111/boj.12234

Chen SC, Liu ZJ, Zhu GH, Lang KY, Tsi ZH, Luo YB, Jin XH, Philip JC, Wood JJ, Gale SW, Ormerod P, Vermeulen JJ, Wood HP, Clayton D, Bell A (2009) Orchidaceae. In: Wu ZY, Raven PH, Deyuan H (Eds) Flora of China. Vol. 25. Science Press, Beijing and Missouri Botanical Garden Press, S. Louis, 1–570.

Das D, Datta BK (2016) *Spiranthes sinensis* (Persoon) Ames [Orchidaceae]—a new record for Tripura in NE India. Pleione 10 (2): 396–399.

De Vogel, ET (1987) Manual of herbarium taxonomy: theory and practice. UNESCO, Jakarta, 164 pp.

Deb DB (1983) Flora of Tripura state, Volume 2. Today and Tomorrow's Printers and Publishers, New Delhi, 601 pp.

Debnath B, Sarma D, Paul C, Debnath A (2016) *Arundina graminifolia* (D.Don) Hochr (Orchidaceae)—a new addition to the flora of Tripura. Asian Journal of Plant Science and Research 6 (3): 28–31.

Islam MM, Huda MK, Halim M (2016) An enumeration to the orchids and their conservation status in greater Sylhet, Bangladesh. Bangladesh Journal of Plant Taxonomy 23 (1): 13–25. https://doi.org/10.3329/bjpt.v23i1.28335

Kumar CS, Kumar CS (2005) An orchid digest of Manipur, northeastern India. Rheedea 15 (1): 1–70.

Kumar P, Gale SW, Phaxaysombath T, Bouamanivong S, Fischer GA (2018) Additions to the orchid flora of Laos and taxonomic notes on orchids of the Indo-Burma region. Taiwania 63 (1): 61–83. https://doi.org/10.6165/tai.2018.63.61

Panda SP, Singh BK, Sharief MU, Hameed SS, Pramanik A (2016) The genus *Zeuxine* Lindl. (Orchidaceae) in Tripura state, India. Journal of Threatened Taxa 8 (14): 9675–9677. https://doi.org/10.11609/jott.2843.8.14.9675–9677

Schuiteman A, Bonnet P, Svengsuksa B, Barthélémy D (2008) An annotated checklist of the Orchidaceae of Laos. Nordic Journal of Botany 26 (5–6): 257–316. https://doi.org/10.1111/j.1756–1051.2008.00265.x

Sharma DK (2010) Bio-diversity resource book of Tripura. International Book Distributers, Dehra Dun, 518 pp.

Vuong TB, Sridith K (2016) The phytogeographic note on the orchids flora of Vietnam: a case study from the Hon Ba Nature Reserve, Central Vietnam. Taiwania 61 (2): 127–140. https://doi.org/10.6165/tai.2016.61.127

Willis KJ (2017) State of the world's plants 2017. Royal Botanic Gardens, Kew, 96 pp.

Zhou X, Cheng Z, Liu Q, Zhang J, Hu A, Huang M, Hu C, Tian H (2016) An updated checklist of Orchidaceae for China, with two new national records. Phytotaxa 276 (1): 1–148. http://doi.org/10.11646/phytotaxa.276.1.1