

The genus *Nervilia* (Orchidaceae) in Arunachal Pradesh (India) with a new addition for the flora of this state

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Abstract

This article provides the diversity and distribution of the genus *Nervilia* in Arunachal Pradesh including a new record: *Nervilia punctata*. The different species are presented here with a brief description, illustrations, and photographs. An identification key is also provided.

Résumé

Cet article présente la diversité et la distribution du genre *Nervilia* dans l'Arunachal Pradesh incluant un nouvel enregistrement : *Nervilia punctata*. Les espèces sont présentées ici avec une brève description, des illustrations et des photographies. Une clé d'identification est également fournie.

Key words: Ecological – morphological informations, Nerviliinae, taxonomy.

Mots clés : informations écologiques – morphologiques, Nerviliinae, taxinomie.

Introduction

Arunachal Pradesh is considered to be luxuriant in orchid diversity and has been recognized as ‘Orchid Paradise’ because of the maximum concentration of species (about 40% of the country) in the state when compared to the other states of India (Rao, 2010). Due to its varied climatic conditions, Arunachal Pradesh contains the largest group of temperate and subtropical orchids. The lush green forests spread over numerous hills rising from about 100 m to a height of about 7000 m covered with eternal snow and crisscrossed by numerous rivers, provide a congenial environment to myriads of life forms that coexist harmoniously. Orchids form a dominant group of plants with their attractive and unique blooms. Over 600 orchid species, including 65 endemics, have been reported from Arunachal Pradesh (Singh *et al.*, 2019).

The genus *Nervilia* Commerson ex Gaudichaud (1829: 421, t. 35) is comprised of approximately 78 species (POWO, 2022) distributed in tropical and subtropical Africa, Asia, Australia, and the Southwest Pacific Islands (Pettersson, 1991; Gale *et al.*, 2015; 2018). They are characterized by having prominent fan-shaped venation of leaves and developing flowers and leaves at different times. All above-ground parts died at the end of the growing season (Pridgeon *et al.*, 2005). The members of the genus are terrestrial herbs mostly growing in small colonies. The dormant tuber, when ready for new growth, produces an inflorescence, and when the flowers have withered the same tuber produces a leaf (Seidenfaden & Wood, 1992). There are about 15 species (6 endemics) of *Nervilia* in India (Singh *et al.*, 2019; Misra, 2019). Nine species (fig.1) are reported to occur in Arunachal Pradesh viz: *Nervilia concolor* (Blume, 1825: 416) Schlechter (1911: 404), *N. gammieana* (Hooker, 1883: t. 6676) E. Pfitzer (1888: 56, t. 44), *N. hookeriana* (King & Pantling, 1895: 129) Schlechter (1911: 405), *N. holochila* (Mueller, 1866: 200) Schlechter (1906: 48), *N. infundibulifolia* Blatter & McCann (1932: 725), *N. juliana* (Roxburgh, 1832: 63) Schlechter (1911: 402), *N. macroglossa* Schlechter (1911: 402), *N. plicata* (Hooker, 1890: 120) Schlechter (1911: 403) and *N. simplex* (Sprengel, 1826: 736) Schlechter (1911: 401).

During various survey tours to different places in Arunachal Pradesh, few species of *Nervilia* were collected. Among them, *N. punctata* (Blume, 1849: 32) Makino (1902: 199) was hitherto unrecorded for Arunachal Pradesh. The species is reported here as a new addition to the state from Dibang Valley. During the present survey we have not seen any herbarium materials or any natural population of *N. hookeriana* and *N. holochila* in Arunachal Pradesh.

Material and methods

The present study is based primarily on herbarium material (dried specimens) of *Nervilia* studied at ARUN, ASSAM, CAL, GUBH, K, OHT (Orchid Herbarium Tippi) and P. The herbarium studies were combined with the examination of live plants in natural populations. The plants were collected, photographed in the field, pressed, dried following the standard methods of Jain & Rao (1977) and deposited in TOSEHIM, Regional Orchids Germplasm Conservation & Propagation Centre (Assam).

Taxonomic treatment

Key to the species of *Nervilia* from the Arunachal Pradesh state

- 1. Inflorescence 2 or many flowered2
- 1a. Inflorescence 1-flowered4
- 2. Inflorescence 2-flowered6. *N. plicata*
- 2a. Inflorescence 3–15 flowered3
- 3. Flowers pink2. *N. gammieana*
- 3a. Flowers greenish-yellow 1. *N. concolor*
- 4. Leaf usually 2 or 3 on the same stem 4. *N. juliana*
- 4a. Leaf solitary5
- 5. Leaves with purple-maroon streaks along the veins3. *N. infundibulifolia*
- 5a. Different leaves6

6. Leaves densely pubescent on the upper surface 7. *N. simplex*
 6a. Flowers greenish-yellow 7
 7. Leaves suborbicular-ovate, 3–4 cm across, apex acute 6. *N. punctata*
 7a. Leaves orbicular-cordate or flabellate-orbicular to cordate 3.8–4.7 cm across, apex acuminate 5. *N. macroglossa*

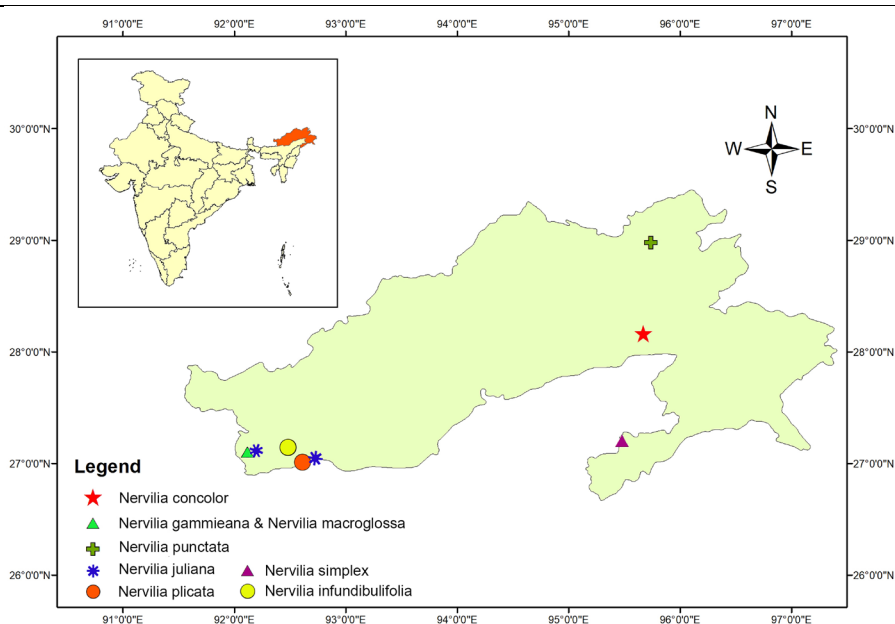


Figure 1: Geographic distribution of *Nervilia* species occurring in Arunachal Pradesh

1. *Nervilia concolor* (Blume) Schlechter, *Botanische Jahrbücher für Systematik* 45: 404 (1911).

Homotypic synonyms: *Cordyla concolor* Blume, *Bijdragen tot de flora van Nederlandsch Indië*: 416 (1825).

Type: Java. Mt Salak. Blume s.n. (holotype: not located).

Roptrostemon concolor (Blume) Lindley, *The Genera and Species of Orchidaceous Plants* 453 (1840); *Pogonia concolor* (Blume) Blume, *Museum Botanicum* 1: 32 (1849).

Heterotypic synonyms: *Nervilia aragoana* Gaudichaud, *Voyage autour du monde* 422 (1829); *Epipactis carinata* Roxburgh, *Hortus Bengalensis, or a Catalogue of the Plants Growing in the Honourable East India Company's Botanical Garden at Calcutta*. Serampore 3: 454 (1832); *Pogonia carinata* (Roxburgh) Lindley, *The Genera and Species of Orchidaceous Plants* 414 (1840); *Pogonia flabelliformis* Lindley, *The genera and species of orchidaceous plants* 415 (1840); *Pogonia nervilia* Blume, *Museum Botanicum* 1: 32 (1849), nom. Superfl.; *Pogonia gracilis* Blume, *Collection des Orchidées le plus remarquables de l'Archipel Indien et du Japon* 129, t. 57 (1858); *Pogonia scottii* Reichenbach f., *Flora* 55: 276 (1872); *Nervilia carinata* (Roxburgh) Schlechter, *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 45: 404 (1911); *Nervilia carinata* (Roxburgh) Schlechter, *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 45: 404 (1911); *Nervilia scottii* (Reichenbach f.) Schlechter, *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 45: 404 (1911); *Nervilia yaeyamensis* Hayata, *Icones plantarum formosanarum nec non et contributiones ad floram formosanam* 2: 140–141 (1912); *Nervilia tibetensis* Rolfe, *Notes from the Royal Botanic Garden, Edinburgh* 8(37): 128 (1913); *Aplostellis flabelliformis* (Lindley) Ridley, *The Flora of the Malay Peninsula* 4: 203 (1924); *Nervilia flabelliformis* (Lindley) Tang & F. T. Wang, *Acta Phytotaxonomica Sinica* 1(1): 68 (1951).

Specimens examined: Arunachal Pradesh, East Siang district, Dying Ering Wildlife sanctuary, 10.06.2017, *Ona Apang 5450 & 5451* (OHT!); Lower Dibang valley district, Bomjir, 01.04.2022, *Gogoi 01144* (TOSEHIM!). [Fig: 2 & 3].

Description: Plant with subglobose to ovoid tubers 1–1.7 cm across, 3–5 noded. Leaf broadly cordate-ovate, 9–15 × 10–18 cm, glabrous, many veined, margin undulate, acute or rounded at apex; petiole erect 2.5–11 cm. Inflorescence 15–45 cm long, 4–15 flowered; peduncle green or purple; floral bracts reflexed, linear-lanceolate, 1–1.6 × 0.1–0.2 cm. Flowers resupinate, emitting an unpleasant odor; sepals and petals yellowish green, lip pale green, white, pinkish white, or pale green with purplish brown venation. Pedicelled and ovary ridged 0.7–1.3 cm long; ovary non-resupinate, winged, oblong, 0.5 × 0.3 cm green. Sepals 1.5–2.2 × 0.2–0.3 cm, linear-lanceolate, acute at apex; petals 1.2–2 × 0.2–0.25 cm, linear-

lanceolate, acute at apex; lip $1.2\text{--}1.7 \times 0.5\text{--}0.8$ cm, ovate-oblong, 3 lobed, lateral lobes $0.2\text{--}0.4 \times 0.2\text{--}0.4$ cm, erect, embracing the column, midlobe $0.3\text{--}0.5 \times 0.3\text{--}0.5$ cm, ovate-elliptic, acute at apex. Column white, *ca.* 1 cm long; anther 0.12 cm across; pollinia 2.

Flowering: May – June. **Habitat:** Terrestrial, growing on open grassland and loose soil at 200– 1100 m elevation. **Local distribution:** Lower Dibang valley district (Bomjir), East Siang district (Dying Ering wildlife sanctuary).

Note: Ona Apang (2020) recorded *N. holochila* as occurring in Arunachal Pradesh. However, his identification is erroneous and as per the only photograph and description provided in his article, it matches closely with *N. concolor*. According to Barrett *et al.* (2022), the native range of *N. holochila* is North Kimberley, from Beverley Springs Station homestead, Prince Regent River, Mount Fyfe, Mitchell Plateau, and Theda Station. The plant also grows in the Northern Territory, Queensland, and Papua New Guinea and occurs usually in dark, peaty soils, from open woodland, whereas Ona Apang recorded it from grassland. Due to its geographical distribution, it is not possible to find this species in Arunachal Pradesh. *N. holochila* is closest to *N. concolor* but differs in having widely spreading flowers (vs. not widely spreading in *N. concolor*) and a lip with white at the base grading to pink at the apex, sometimes entirely pink, hirsute ridge extending to the entire length of the lip (vs. white with a filigree of darker hairy veins in *N. concolor*).

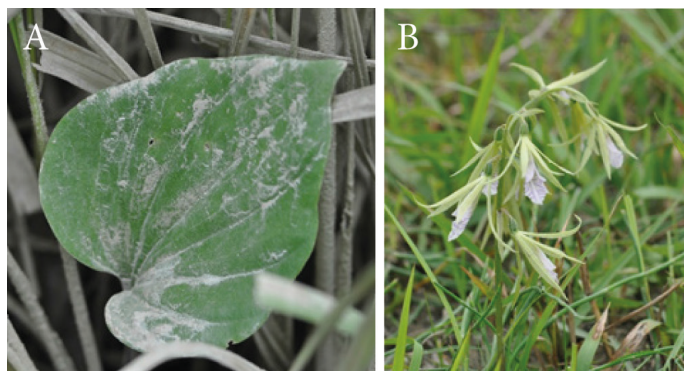


Figure 2:
Nervilia concolor.
A – leaf; B –
flowers. Photos by
Khyanjeet Gogoi.

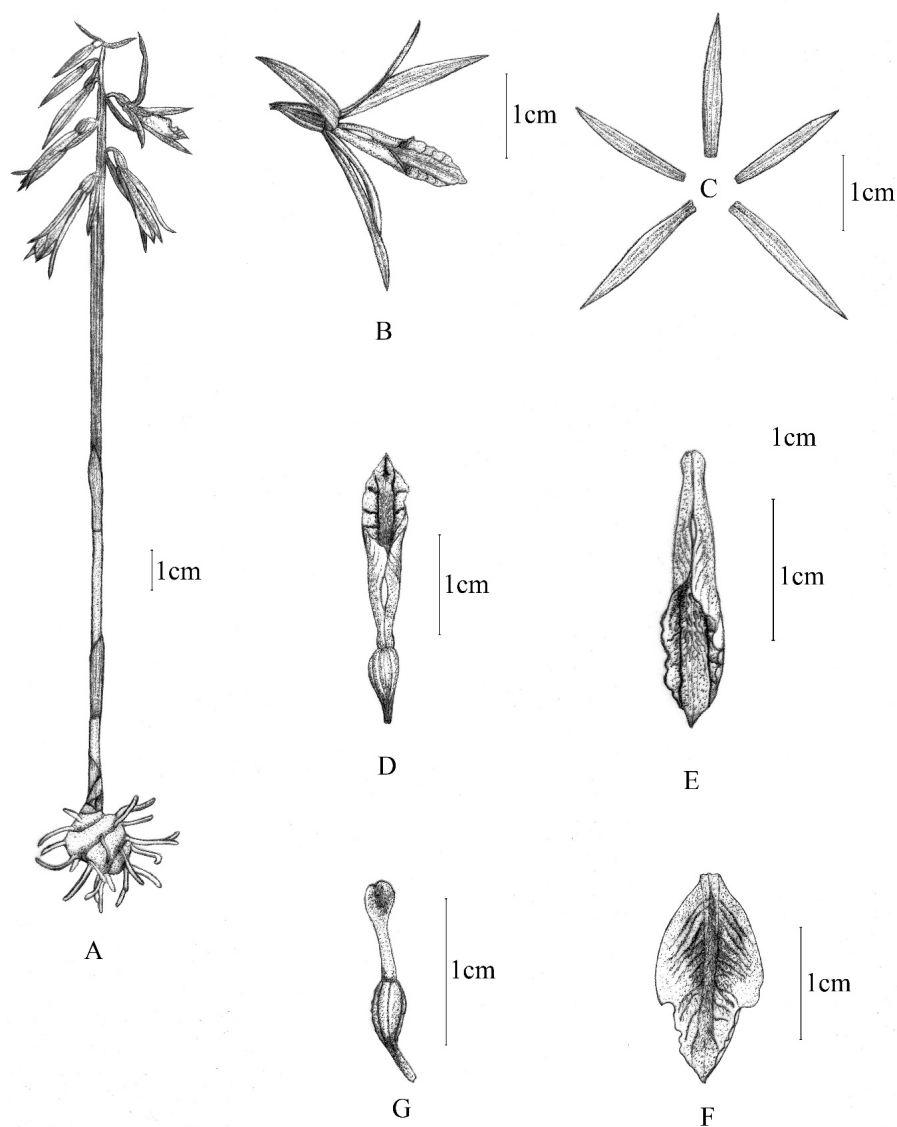


Figure 3: *Nervilia concolor*. A – tuber with inflorescence; B – flower; C – perigone; D – lip with ovary & column; E – lip in its natural form; F – spread lip; G – ovary and column. Drawn by Khyanjeet Gogoi.

2. *Nervilia gammieana* (Hooker f.) Pfitzer, *Die Natürlichen Pflanzenfamilien* 2 (6): 56 (1888).

Homotypic synonym: *Pogonia gammieana* Hooker f., *Curtis's botanical magazine*: 109: t. 6671 (1883).

Type: India, Darjeeling, *Gammie s. n.* (holotype: K!).

Specimen examined: India, Arunachal Pradesh, West Kameng district, Kalaktang, 01.06.1984. *Hegde 4086* (OHT!). [Fig: 4 & 5].

Description: Plant 15–20 cm tall without inflorescence; tuber globular, 3 cm across. Leaf solitary, 10–18 cm long with petiole, appears after flowering, blade flabellate-orbicular to deeply cordate, up to 12 cm in diameter, veined, margin wavy. Inflorescence 10–30 cm long, with 3 tubular, closely adpressed sheaths, densely flowered. Flowers drooping, 2.5 cm long, pink with greenish or yellowish-white lip; floral bract linear-lanceolate; sepals and petals subequal, spreading, lanceolate, up to 2.0–2.5 cm long; lip saccate at base, elliptic-ovate, as long as sepals; hypochile convolute, embracing the column, with 2 short triangular side-lobes and two central parallel ridges; epichile with crenulate margin, hairy above, with 3 central parallel ridges. Column white with dark purplish apex, 1.0–1.5 cm long. Ovary with 0.3 cm long stalk, ovary and stalk both winged.



Flowering: May – June. **Habitat:** Terrestrial herbs, growing on moist humus-rich soil at the altitude of 600–900 m. **Local distribution:** West Kameng district, Kalaktang.

Figure 4: Leaf of *Nervilia gammieana*.
Photo by Khyanjeet Gogoi.

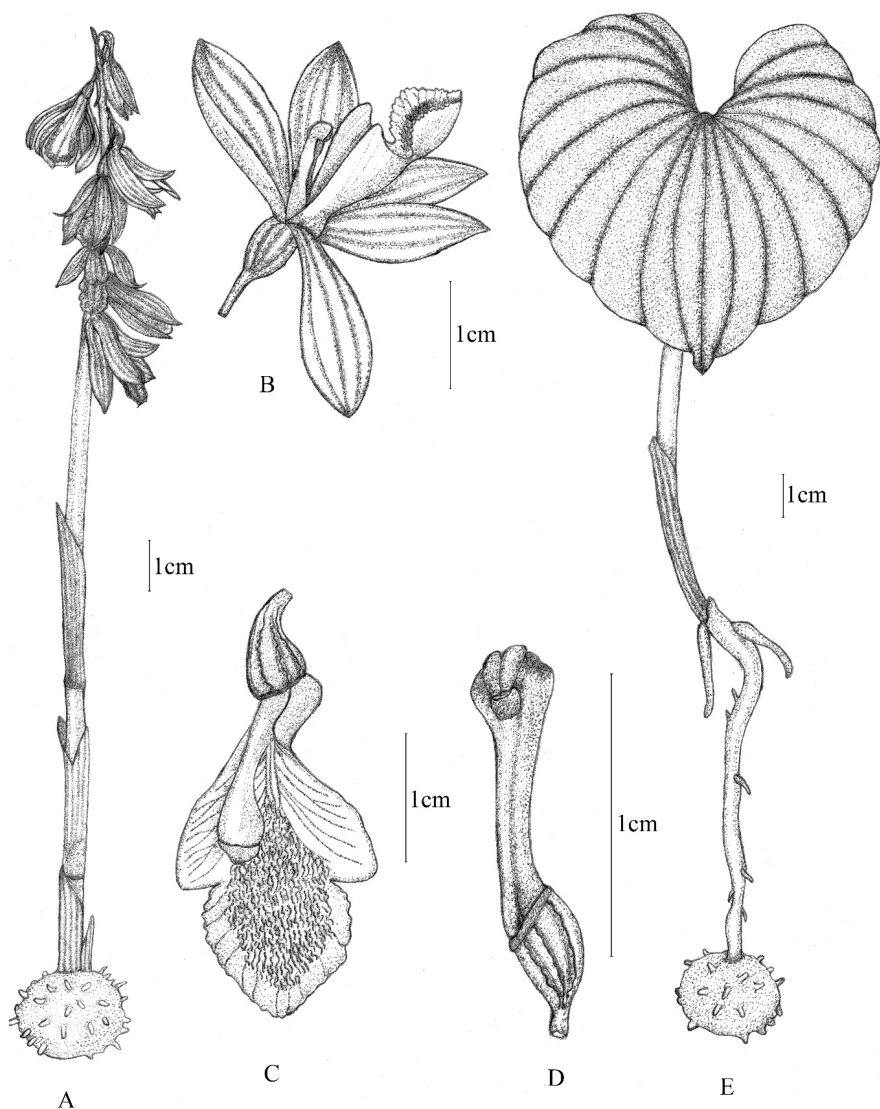


Figure 5: *Nervilia gammieana*. A – tuber with inflorescence; B – flower; C – lip with ovary & column; D – ovary and column; E – tuber with leaf. Drawn by Khyanjeet Gogoi.

3. *Nervilia infundibulifolia* Blatter & McCann, *The journal of the Bombay Natural History Society* 35: 725 (1932).

Type: India, N Kanara, Yellapur, *T.R. Bell* mass. *Icon. E. Bell* (holotype: BLAT).

Heterotypic synonyms: *Nervilia hallbergii* Blatter & McCann, *The journal of the Bombay Natural History Society* 35: 726. (1932); *Nervilia calcicola* Kerr, *Journal of the Siam Society. Natural History Supplement* 9 (2): 242, t. 7. (1933).

Specimens examined: India, Arunachal Pradesh, West Kameng district, Kalaktang, 26.06.1980, *Hegde 80866* (OHT!); Tippi, 10.05.1984, *Rao 31037* (OHT!); Between Elephant flat & Sessa, 29.03.1988, *Hegde 25349* (OHT!). [Fig: 6 & 7].

Description: Plant tuber globose, 0.6–1.5 cm across. Leaf polygonal cordate and cornutely-toothed at tips of main veins $2.2\text{--}5.2 \times 2.5\text{--}5.4$ cm across; petiole-like stalk erect, 1.2–4.0 cm long. Inflorescence 6.5–11.0 cm long, with solitary flower. Flower erect, widely opening; floral bracts $0.3\text{--}0.5 \times 0.1\text{--}0.2$ cm elliptic, acute at apex; sepals and petals purplish-brown with purple flecks, linear-lanceolate, acute at apex; sepals $1.4\text{--}1.6 \times 0.2\text{--}0.3$ cm; petals slightly falcate, $1.3\text{--}1.7 \times 0.15\text{--}0.2$ cm; lip white tinged with purple, with short papillae and purple-red strips on adaxial surface, $1.7\text{--}2.0 \times 0.4\text{--}0.5$ cm, oblong, 3 lobed, lateral lobes $0.8\text{--}0.9 \times 0.12\text{--}0.15$ cm, embracing the column, margin entire, midlobe $0.8\text{--}0.9 \times 0.4\text{--}0.5$ cm, rounded, subtruncated at the apex. Column 0.8–1.0 cm long, straight.

Flowering: June – July. **Habitat:** Terrestrial growing in the evergreen broad-leaved forest, deciduous forest, and riparian bamboo forest at the altitude of 300–1800 m. **Local distribution:** West Kameng district (Tippi, Kalaktang).

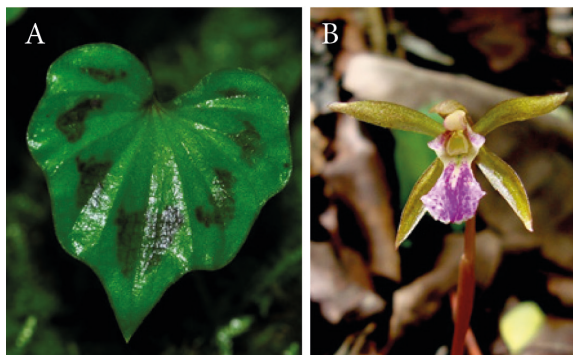


Figure 6: *Nervilia infundibulifolia*. A – leaf; B – flower. Photos by Khyanjeet Gogoi.

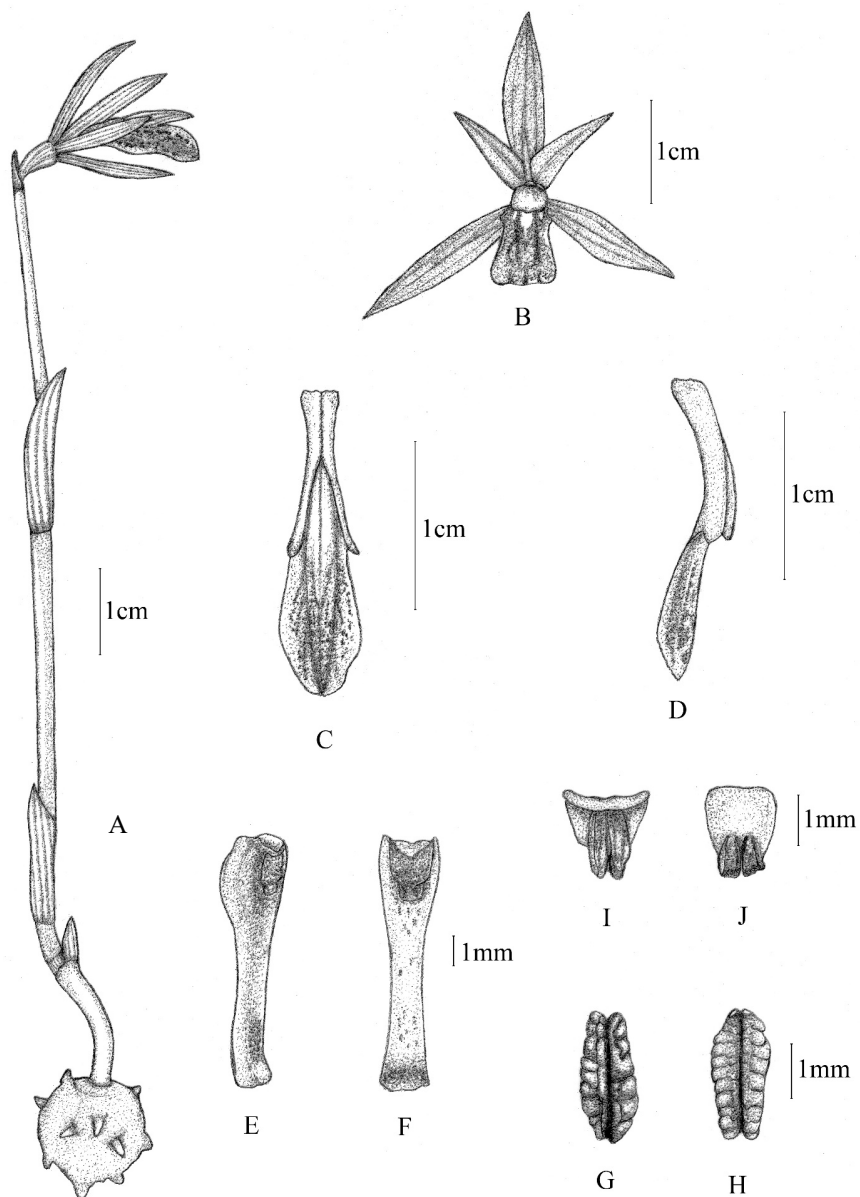


Figure 7: *Nervilia infundibulifolia*. A – tuber with inflorescence; B – flower; C – lip front view; D – lip side view; E, F – column; G, H. pollinia ventral and dorsal view; I, J – anther cap ventral and dorsal view. Drawn by Khyanjeet Gogoi.

4. *Nervilia juliana* (Roxburgh) Schlechter, *Botanische Jahrbücher für Systematik* 45: 402 (1911).

Homotypic synonyms: *Epipactis juliana* Roxburgh, *Flora indica* 3: 453 (1832).

Type: India, near Calcutta, (icon. of) '*Arethusa juliana*' Roxburgh 2019 (holotype: CAL, isotype: K!)

Pogonia juliana (Roxburgh) Wall. ex Trimen, *A hand-book to the flora of Ceylon* 4: 225 (1898).

Specimens examined: India, Arunachal Pradesh, West Kameng district, Kalaktang, 26.06.1980, *Hegde 4066* (OHT!); Tippi, 21.07.1982, *Rao 4164* (OHT!); Tippi, 10.05.1983, *Rao 8094* (OHT!); Tippi, 18.06.1983, *Rao 30937* (OHT!); Tippi, 28.05.1985, *Rao 20039* (OHT!); Tippi, 12.06.1985, *Hegde 31005* (OHT!). [Fig: 8 & 9].

Description: Plants with globose tubers, 1–2 cm across. Leaf 2–5 cm across, usually 2 or 3 on the same stem, ovate, acute at apex. Inflorescence 7–15 cm long, erect. Flowers 2.5–3 cm across, solitary; floral bracts 0.2×0.15 cm, greenish purple, oblong; sepals linear-lanceolate, concave, acute at apex, 3 nerved; dorsal sepal 1.8×0.4 cm; lateral sepals 1.7×0.25 cm; petals 1.6×0.25 cm, 1 nerved, linear-lanceolate, falcate; lip 2.2 cm long, longer and broader than sepals and petals, saccate at base, elliptic-ovate, 3 lobed, hypochile convolute, falcate, acute, 0.8–0.9 cm long, white, epichile concave, with a fleshy median ridge, elliptic-ovate, acute, $1.6\text{--}1.9 \times 0.8\text{--}0.9$ cm, lateral lobes narrow, falcate, rhombic; midlobe acute. Column $0.6\text{--}0.7 \times 0.2\text{--}0.3$ cm, clavate.

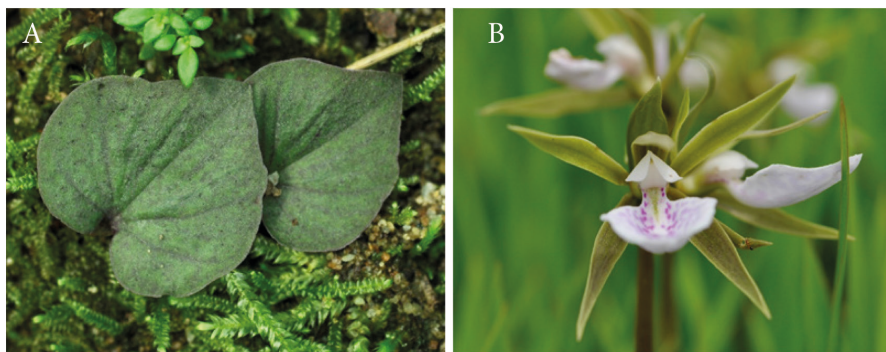


Figure 8: *Nervilia juliana*. A – leaves; B – flower. Photos by Khyanjeet Gogoi.

Flowering: May – August. **Habitat:** Terrestrial, growing on open grassland and loose soil at the altitude of 200–500 m. **Local distribution (map. 1):** West Kameng district (Tippi, Kalaktang).

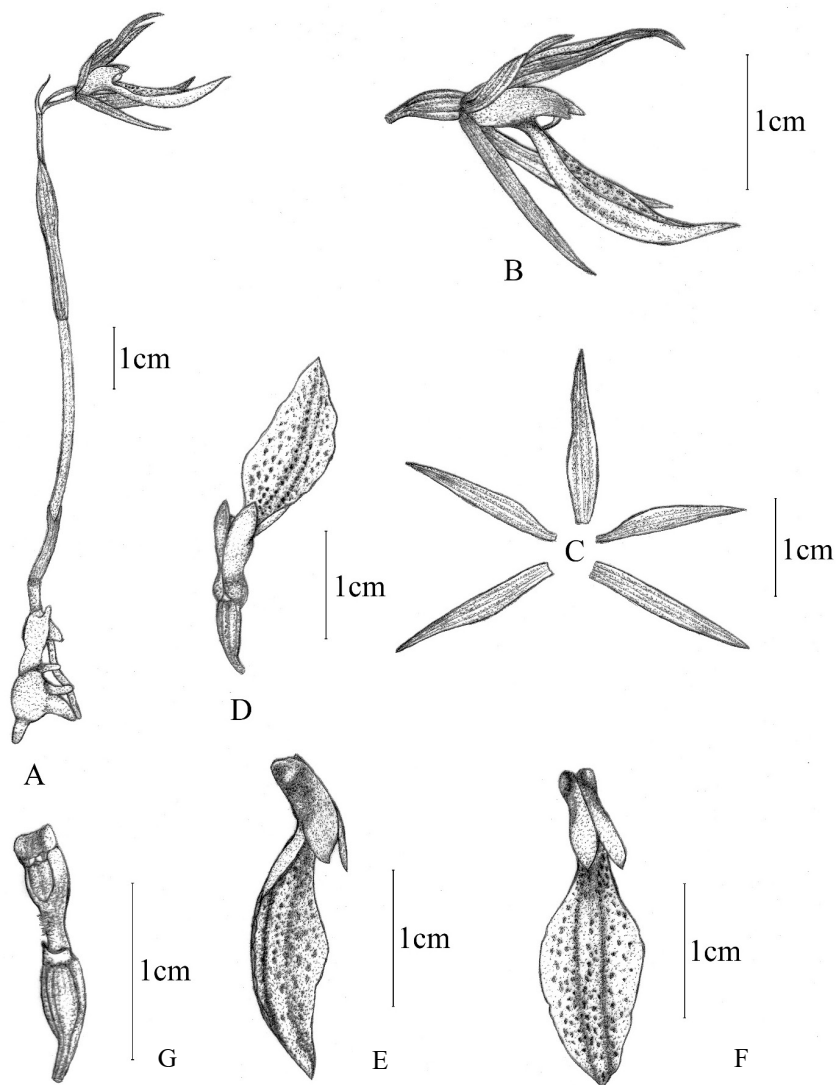


Figure 9: *Nervilia infundibulifolia*. A – tuber with inflorescence; B – flower side view; C – perigone; D – lip with ovary & column; E, F – lip side view and front view; G – ovary and column. Drawn by Khyanjeet Gogoi.

5. *Nervilia macroglossa* (Hooker f.) Schlechter, *Botanische Jahrbücher für Systematik* 45: 402 (1911).

Homotypic synonym: *Pogonia macroglossa* Hooker f., *Flora of British India* 6: 120 (1890).

Type: India, Sikkim, *Hooker s.n.* (syntype: K!); Sikkim (Tumlang), *Clarke 27725* (syntype: K!).

Specimens examined: India, Arunachal Pradesh, West Kameng district, Kalaktang, 26.06.1980, *Hegde 4065* (OHT!); Kalaktang, 26.06.1980, *Hegde 4066* (OHT!); Tippi, 16.06.1992, *Rao 26063* (OHT!). [Fig: 10 & 11].

Description: Plant with globose tuber, $1.2\text{--}1.5 \times 1.2\text{--}1.4$ cm. Leaf $3.8\text{--}4.7 \times 4\text{--}4.55$ cm, solitary, cordate, margins entire, apex acuminate; petiole $5.5\text{--}7$ cm long. Inflorescence $6\text{--}13$ cm long, erect, terete, slender, glabrous; peduncle $5\text{--}12$ cm, with $2\text{--}3$, $2\text{--}3$ cm long tubular, stem-clasping sheaths; rachis $2\text{--}3$ cm long with a solitary drooping flower; pedicel and ovary $0.4\text{--}0.7$ cm long, drooping, ribbed, glabrous; floral bract linear-lanceolate, acute, $0.35\text{--}0.4 \times 0.02\text{--}0.03$ cm. Flower solitary, $2\text{--}4$ cm across, sepals and petals white flushed with pink. Sepals and petals subsimilar, linear-lanceolate, acute at apex; dorsal sepal $2.5\text{--}3.3 \times 0.2\text{--}0.4$ cm; lateral sepals $2.8\text{--}3 \times 0.2\text{--}0.4$ cm; petals $2.5\text{--}2.8 \times 0.2\text{--}0.3$ cm; lip $2.4\text{--}3.5 \times 0.5\text{--}0.8$ cm, 3 lobed, narrowly oblong or spatulate; lateral lobes convolute around the column; apical lobe obovate, apex subacute or obtuse, margins slightly undulate, softly pubescent. Column $0.5\text{--}1.3$ cm long, slender.

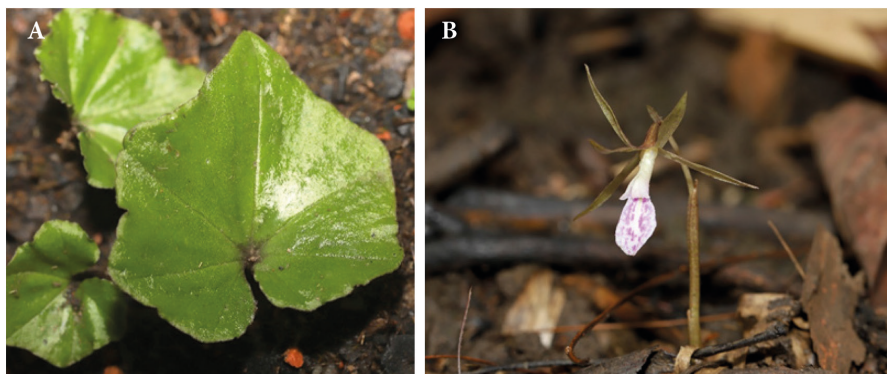


Figure 10: *Nervilia macroglossa*. A – leaves; B – flower. Photos by Khyanjeet Gogoi.

Flowering: May – June. **Habitat:** Terrestrial growing during monsoon in evergreen deciduous forests and bamboo forests at an elevation of 400-1100 m.

Local distribution: West Kameng district (Tippi, Kalaktang).

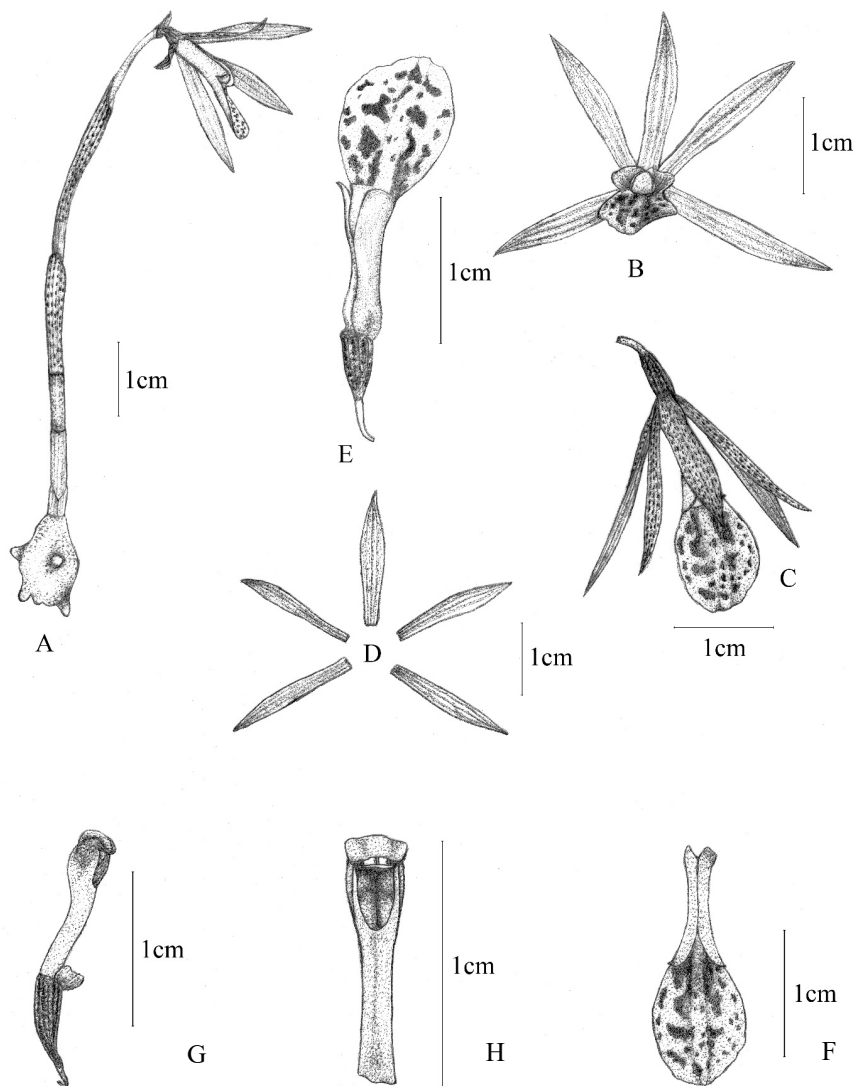


Figure 11: *Nervilia macroglossa*. A – tuber with inflorescence; B, C – flower; D – perigone; E – lip with ovary & column; F – lip spread out; G – ovary and column side view; H – column. Drawn by Khyanjeet Gogoi.

6. *Nervilia plicata* (Andrews) Schlechter, *Botanische Jahrbücher für Systematik* 45: 403(1911).

Homotypic synonyms: *Arethusa plicata* Andrews in *The Botanist's Repository* 5: 321 (1803). Type: E Indies, cult. *A.B. Lambert* (holotype: K!).

Pogonia plicata (Andrews) Lindley in *The genera and species of orchidaceous plants* 415 (1840).

Heterotypic synonyms: *Aplostellis velutina* (C.S.P. Parish & Reichenbach f.) Ridley in *The Flora of the Malay Peninsula* 4: 204 (1924); *Cordyla discolor* Blume in *Bijdr Flora van Nederlandsch Indie* 416 (1825); *Roptrostemon discolor* (Blume) Blume in *Flora Javae nec non insularum adjacentium* vi (1828); *Epipactis plicata* Roxburgh in *Flora indica* 1832. 3: 454 (1832); *Pogonia discolor* (Blume) Blume in *Museum botanicum Lugduno-Batavum, sive, Stirpium exoticarum novarum vel minus cognitarum ex vivis aut siccis brevis expositio et descriptio* 1: 32 (1849); *Pogonia biflora* Wight in *Icones plantarum Indiae Orientalis* 5: t. 1758 (1851); *Pogonia dallachyana* F. Mueller ex Benth in *Flora australiensis: a description of the plants of the Australian territory* 6: 310 (1873); *Pogonia velutina* C.S.P. Parish & Reichenbach f. in *Transactions of the Linnean Society of London* 30: 142 (1874); *Pogonia pulchella* Hooker f. in *The botanical magazine* 111: t. 6851 (1885); *Nervilia biflora* (Wight) Schlechter in *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 39: 48 (1906); *Nervilia dallachyana* (F. Mueller ex Benth) Schlechter in *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 39: 48 (1906); *Pogonia purpurea* Hayata in *The journal of the College of Science, Imperial University of Tokyo* 30(1): 345 (1911); *Nervilia apiculate* Schlechter in *Repertorium specierum novarum regni vegetabilis* 1: 41 (1911); *Nervilia porphyrophylla* Schlechter in *Repertorium specierum novarum regni vegetabilis* 1: 41 (1911); *Nervilia purpurea* (Hayata) Schlechter in *Repertorium specierum novarum regni vegetabilis* 10: 6 (1911); *Nervilia velutina* (C.S.P. Parish & Reichenbach f.) Schlechter in *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 45: 403 (1911); *Nervilia discolor* (Blume) Schlechter in *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 45: 403 (1911); *Nervilia discolor* var. *purpurea* (Hayata)

S.S. Ying in *Coloured illustrations of indigeous orchids of Taiwan* 1(2): 253 (1977); *Nervilia plicata* var. *purpurea* (Hayata) S.S. Ying in *Coloured illustrations of indigeous orchids of Taiwan* 2: 276 (1990).

Specimen examined: India, Arunachal Pradesh, West Kameng district, Tippi, 24.05.1997, *Rao 30164* (OHT!). [Fig: 12 & 13].

Description: Plant with globose to ellipsoid tuber, 0.5–2 cm across. Leaf 7.5–11 × 10–13 cm, orbicular-cordate, abaxially green or purple, acute at apex; petiole-like stalk erect, 1.5–3 cm. Inflorescence 12–20 cm, with 2, rarely 3 flowers; floral bracts 0.5–0.7 × 0.1–0.2 cm, lanceolate, acuminate at apex. Flower opening widely; sepals 1.5–2.5 × 0.3–0.4 cm, linear-oblongate, acute at apex; petals 1.4–2.2 × 0.2–0.3 cm, linear-oblongate, acute at apex; lip 1.3–2 × 1–1.3 cm, ovate, 3 lobed, lateral lobes erect, enclosing column, midlobe ovate, emarginated at apex. Column 0.7–1 cm, white.

Flowering: May – June. **Habitat:** Forests, shaded and damp places at an elevation of 200–1000 m. **Local distribution:** West Kameng district, Tippi.



Figure 12: *Nervilia plicata*. A – leaf; B – flowers. Photos by Khyanjeet Gogoi.

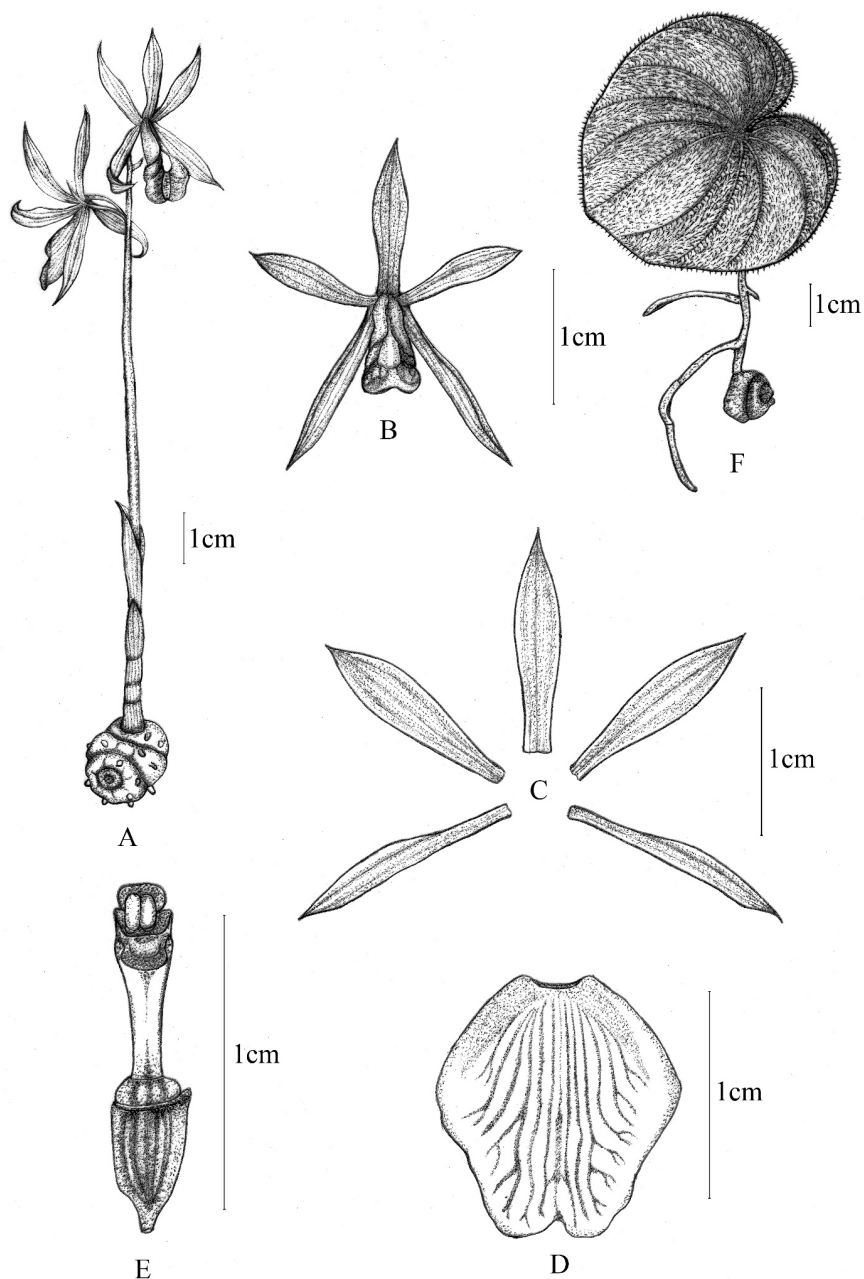


Figure 13: *Nervilia plicata*. A – tuber with inflorescence; B – flower; C – perigone; D – lip; E – ovary and column; F – tuber with leaf. Drawn by Khyanjeet Gogoi.

7. *Nervilia punctata* (Blume) Makino, *Botanical Magazine* 16: 199 (1902).

Homotypic synonym: *Pogonia punctata* Blume, *Museum Botanicum* 1: 32 (1849).

Syntypes: Sumatra. *Korthals s.n.* (syntype: L); Sumatra, *Korthals 653* (syntype: L); *Kuhl & van Hasselt s.n.* (syntype: L).

Aplostellis punctata (Blume) Ridley, *The Flora of the Malay Peninsula* 4: 204 (1924).

Specimen examined: India, Arunachal Pradesh, Upper Dibang valley district, Mipi, 06.08.2022, *Gogoi 01145* (TOSEHIM!). [Fig: 14 & 15].

Description: Plant 5–6 cm tall. Tuber whitish, globose to subglobose, 1.0–1.5 cm in diameter. Leaf solitary, emerging just after flowering, dark green, suborbicular-ovate, 3–4 cm across, glabrous, apex acute, base cordate. Petiole 1.2–1.5 cm long, single tubular sheath at the base. Inflorescence 4–6 cm long, lower portion olive green and upper brownish green, 1-flowered; sheath 1, tubular, 1.3–1.6 × 0.2–0.3 cm, purplish tinged; peduncle with 2 nodes. Flower suberect, widely opened, 2.5–3 cm across, sepals and petals greenish brown with brown flecks, lip white, resupinate. Pedicel and ovary 0.6–0.7 cm long, dark brown, tinged with green. Sepals sub-similar, linear-lanceolate, acute; dorsal sepal 1.2–1.5 × 0.1–0.2 cm, lateral sepals 1.2–1.5 × 0.1–0.2 cm; petals linear-lanceolate, slightly concave, 1.1–1.4 × 0.1–0.2 cm, acute; lip narrowly obovate, 1.2–1.3 cm long, 3-lobed near the middle, lateral lobes, 0.1–0.2 cm wide, acute, median lobe, 0.8–0.9 × 0.4–0.5 cm, ovate or obovate, acute or obtuse apex, slightly reflexed; disk glabrous with one lamella, green from the base of hypochile to near the epichile usually covered with column. Column clavate, 0.5–0.6 cm long, white, glabrous, anther cap white. Pollinia 2, ovoid, yellow.

Flowering: March – April. **Habitat:** Growing in tropical semi-evergreen forests and subtropical forests at an altitude of 1600 m. **Local distribution:** Upper Dibang valley district (Mipi).

Note. The present report of the occurrence of *N. punctata* in Arunachal Pradesh forms a new distributional record for the state.

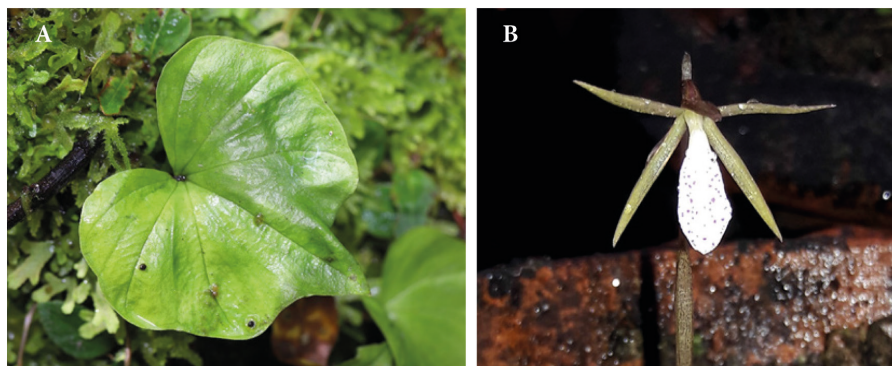


Figure 14: *Nervilia punctata*. A – leaf; B – flower. Photos by Khyanjeet Gogoi.

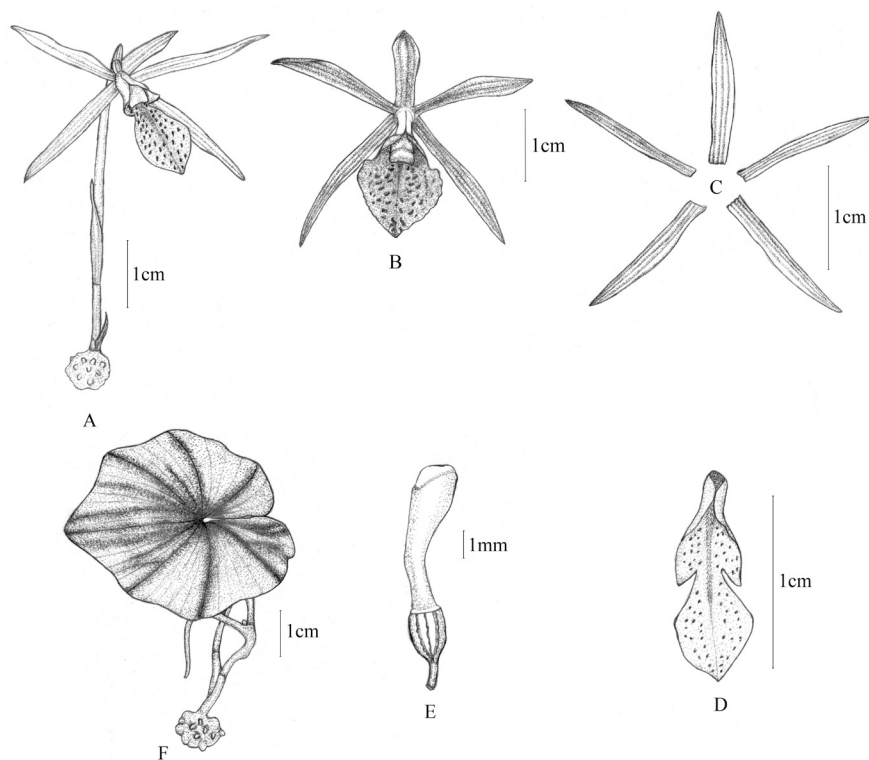


Figure 15: *Nervilia punctata*. A – tuber with inflorescence; B – flower; C – perigone; D – lip; E – ovary and column; F – tuber with leaf. Drawn by Khyanjeet Gogoi.

8. *Nervilia simplex* (Thouars) Schlechter, *Botanische Jahrbücher für Systematik* 45: 401 (1911).

Homotypic synonyms: *Arethusa simplex* Thouars in *Histoire particulière des plantes Orchidées recueillies sur les trois îles australes d'Afrique, de France, de Bourbon et de Madagascar* t. 24 (1822).

Type: Africa, Madagascar, Thouars (lectotype: P!).

Epidendrum simplex (Thouars) Spreng in *Systema vegetabilium* 16. 3: 736 (1826);

Pogonia simplex (Thouars) Reichenbach f. in *Xenia orchidacea* 2: 92 (1865).

Heterotypic synonyms: *Aplostellis simplex* Thouars in *Histoire particulière des plantes Orchidées recueillies sur les trois îles australes d'Afrique, de France, de Bourbon et de Madagascar* t. 24 (1822); *Stellorkis aplostellis* Thouars in *Histoire particulière des plantes Orchidées recueillies sur les trois îles australes d'Afrique, de France, de Bourbon et de Madagascar* t. 24 (1822); *Bolborchis crociformis* Zollinger & Moritzi in A. Moritzi, *Systematisches Verzeichniss* 89 (1846); *Pogonia crispata* Blume in *Museum botanicum Lugduno-Batavum, sive, Stirpium exoticarum novarum vel minus cognitarum ex vivis aut siccis brevis expositio et descriptio* 1: 32 (1849); *Coelogyne javanica* Lindley in *Folia orchidacea* 5: 17 (1854); *Pogonia thouarsii* Blume in *Collection des Orchidées le plus remarquables de l'Archipel Indien et du Japon* 152 (1859); *Pogonia bollei* Reichenbach f. in *Xenia orchidacea* 2: 88 (1865); *Pogonia prainiana* King & Pantling in *Journal of the Asiatic Society of Bengal. Part 2. Natural History* 65: 129 (1896). *Nervilia crispata* (Blume) Schlechter ex K. Schumann & Lauterbach in *Nachträge zur Flora der deutschen Schutzgebiete in der Südsee*: 240 (1900); *Nervilia fimbriata* Schlechter in K.M. Schumann & C.A.G. Lauterbach, *Nachträge zur Flora der deutschen Schutzgebiete in der Südsee*: 82 (1905); *Nervilia bollei* (Reichenbach f.) Schlechter in *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 45: 405 (1911); *Nervilia humilis* Schlechter in *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 53: 551 (1915); *Nervilia reniformis* Schlechter in *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 53: 551 (1915); *Nervilia francoisii* H. Perrier in *Bulletin trimestriel de l'Académie malgache n.s.*, 21: 304 (1928); *Nervilia monantha* Blatter & McCann in *Journal of Bombay Natural History*

Society 35: 724 (1932); *Nervilia bathiei* Senghas in *Adansonia, n.s.*, 4: 303 (1964); *Nervilia erosa* P.J. Cribb in *Kew Bulletin* 32: 155 (1977); *Nervilia crociformis* (Zollinger & Moritz) Seidenfaden in *Dansk Botanisk Arkiv* 32: 151 (1978); *Nervilia prainiana* (King & Pantl.) Seidenfaden in *Dansk Botanisk Arkiv* 32(2): 149 (1978).

Specimen examined: India, Arunachal Pradesh, Tirap district, *Deomali*, 10.05.2021, *K. Gogoi & Chowlu 0007* [TOSEHIM!]. [Fig: 16 & 17].

Description: Plant with ovoid tuber, 1.2 cm across. Leaf 2.5–4 × 2.5–5 cm, fleshy, cordate; petiole-like stalk erect, 2–5 cm long. Inflorescence 3–6 cm long; floral bracts ovate-lanceolate. Flower solitary, erect, opening widely, 1.8–2.5 cm across; sepals 1.3–1.4 × 0.2 cm, lanceolate, acute at apex, Petals 1.1 × 0.2 cm, narrowly lanceolate, lip 1.3 × 0.8 cm, rhombic, strongly reflexed from the middle, 3 lobed, lateral margins erect apical margins irregularly fimbriate, lateral lobes suborbicular, small; disk papillose, with 3 longitudinal ridges extending from near base almost to apex. Column 0.7 cm, minutely curved.

Flowering: May – June. **Habitat:** Terrestrial herbs, growing in open grasslands at 200–300 m elevation. **Local distribution:** Tirap district (Deomali).



Figure 16: Leaf of *Nervilia simplex*. Photo by Khyanjeet Gogoi.

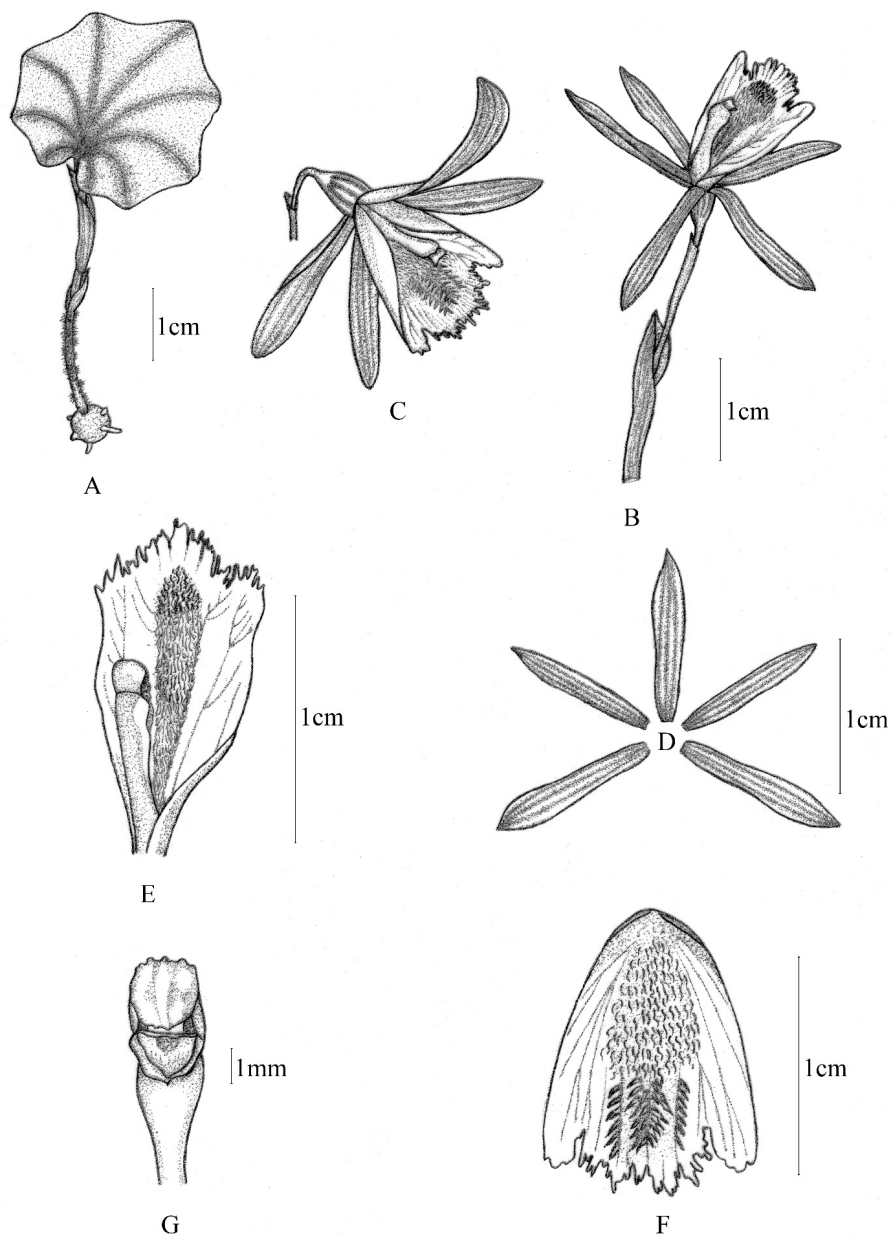


Figure 17: *Nervilia simplex*. A – tuber with leaf; B – inflorescence; C – flower; D – perigone; E – lip with column; F – lip; G – column. Drawn by Khyanjeet Gogoi.

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