

***Phlegmariurus vernicosus* (Hooker & Greves) Å. Löve & D. Löve (Lycopodiaceae): a new record for Northeast India**

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Abstract

The fern-alley *Phlegmariurus vernicosus* (Hooker & Greves) Å.Löve & D. Löve (Lycopodiaceae) is recorded for the first time from northeast India and is described with morphological and anatomical features.

Key words: *Phlegmariurus vernicosus*, New record, Northeast India.

INTRODUCTION

Fern allies comprises of five families viz., Psilotaceae, Lycopodiaceae, Selaginellaceae, Equisetaceae and Isoetaceae. Lycopodiaceae Mirbel includes 19 genera viz., *Austrolycopodium*, *Dendrolycopodium*, *Diphasiastrum*, *Diphasium*, *Huperzia*, *Lepidotis*, *Lycopodiastrum*, *Lycopodiella*, *Lycopodiodes*, *Lycopodioides*, *Lycopodium*, *Palhinhaea*, *Phlegmariurus*, *Plananthus*, *Pseudodiphasium*, *Pseudolycopodiella*, *Pseudolycopodium*, *Spinulum* and *Urostachys*. The genus *Phlegmariurus* Holubis consists of 13 species. The Northeastern region is the richest region of India in Pteridophytic flora (Bir *et al* 1989). Except a few sporadic works (Alston 1945; Barua *et al* 1989; Bhattacharya *et al* 1995; Dixit 1992; Dutta *et al* 1980; Handique & Konger 1986; Islam 1983; Nath & Bhattacharya 2002; Panigrahi 1960; Thakur 1962) there is no comprehensive work on fern allies of the state of Assam. However, the works of Dixit (1984, 1987, 1992) and Singh & Panigrahi (2005) have given a new impetus on the group in this region. Fraser-Jenkins' (2008) work on Indian Pteridophytes provides a fresh insight in this direction. During the course of ongoing studies on Fern-allies of Assam, the authors collected some specimens of *Phlegmariurus* Holubis from Garbhanga Reserve Forest of Kamrup district of Assam area and later identified as *Phlegmariurus vernicosus* (Hooker & Greves) Å. Löve & D. Löve. Scrutiny of literatures (Alston 1945; Baishya & Rao 1982; Barua *et al* 1989; Bhattacharya *et al* 1995; Bir 1976, 1987, 1993; Bir *et al* 1989; Borthakur *et al* 2001; Dixit 1984, 1987, 1992; Dixit & Vohra 1984; Dutta *et al* 1980; Fraser-Jenkins 2008; Handique & Konger 1986; Islam 1983; Jain 1991; Kachroo *et al* 1989; Kaur & Chandra 1994; Manickam & Irudayaraj 1992; Mukhopadhyay 2001; Nath & Bhattacharya 2002; Panigrahi 1960; Panigrahi & Choudhury 1962; Panigrahi & Dixit 1967a, b, 1968; Singh & Panigrahi 2005; Thakur 1962) revealed that *Phlegmariurus vernicosus* has never been reported either from the present political boundary of North-eastern states of India and hence the occurrence of the species has been recorded



PLATE - I: *Phlegmariurus vernicosus*. Figs. 1 - 15. External morphological features. 1. Habit; 2. A part of plant on herbarium sheet; 3 & 4. Leaf arrangement; 5. A vegetative leaf; 6. A spreading vegetative leaf; 7. Ligule; 8. A strobilus; 9. Arrangement of sporophylls; 10. A sporophyll; 11. A spreading sporophyll; 12. A sporophyll with sporangium; 13. A sporangium; 14. Spores; 15. Spores with measurement.

for the first time in Garbhanga Reserve Forest of Kamrup district in Assam. A brief description of the species with anatomical features of the species is provided here in the present communication. The collected specimens were processed and preserved as herbarium specimens following Jain & Rao (1977) and have been deposited in the Herbarium of Botany Department, Gauhati University (GUBH).

Phlegmariurus vernicosus (Hooker & Greves) Å. Löve & D. Löve, *Taxon* 26(2-3): 324. 1977. *Lycopodium vernicosum* Hooker & Greves in *Hook. Bot. Misc.* 2: 364. 1831. *Huperzia vernicosa* (Hooker & Greves) Treviranus, *Atti. Soc. Ital. Sci. Nat.* 17: 248. 1875. 1831; *Spring, Mem. Acad. Sci. Belg.* 15: 38. 1843; 24(2): 17. 1850; Dixit, *Lycopod. in India*: 46-48, Plate-I, Fig. 3 A-C. 1987.

Type: MADRAS: Wight s.n. (CAL).

Specimens examined: **INDIA: Kerala**—Trivandrum: Ponmudi, 1115 m, 03.01.1974, Nair 51662 (CAL); **Tamilnadu**—Courtallam (Madras), Wight s.n. ex. Herb. Greville (CAL); **Assam:** Kamrup, Gorbhanga R.F., Himu Roy 147 (GUBH) and S.K. Borthakur 1095 (GUBH).

Location: 260157.0 N and 914257.6 E

Morphological analysis: Pendulous epiphyte, *ca.* 10-35 cm long, thick, 8-10 mm in diameter, rigid, many time dichotomously branched (**Fig. 1**). Leaf ligule (**Fig. 7**) papery, hyaline, ovate, with a dark brown median line extending from base to apex. Vegetative leaves (**Fig. 5-6**) *ca.* 9-11 x 2-2.5 mm, shining green to pale white on drying, reflexed downwards from top to bottom, thin to sub-coriaceous, margins pale, wavy, sub-revolute, long attenuate, decurrent at base, midrib obscure, folded downwards above the base without torsion. Strobili (**Fig. 8-9**) round elongated, *ca.* 4-6 x 1-2 cm, borne at the apex of the branches; Sporophylls (**Fig. 10-12**), *ca.* 7.5-8 x 2-2.5 mm, broad at base, 8 whorled, vernicose, shining green, pale white on drying, thin to sub-coriaceous, margins pale, broad at base, sub-revolute, long attenuate, midrib obscure, reflexed at bottom; Sporangia (**Fig. 13**) *ca.* 1-1.5 X 0.3-0.5 mm, kidney shaped, placed at the axils of unaltered leaves from the base to apex of the strobilli. Spores (**Fig. 14-15**) 28-35 μ m. hyaline, pitted and trilete.

Anatomical features : T.S. of vegetative leaf (**Fig. 16-18**) is narrowly oval in outline with tapering ends. The epidermal layer is always infested with certain endophytic filamentous organisms. Except near the vascular region most of the epidermal cells possess small and round reproductive bodies of the associated filamentous organism. The epidermal layer is followed by round and hexagonal or pentagonal parenchymatous cells encircling the vascular bundle which consists of a cylinder of phloem outside and exarch xylem inside.

Internal structure of sporophyll (**Fig. 19-22**) is similar to that of vegetative leaf. It is narrowly to broadly oval in outline. Epidermis is distinct. Rest of the anatomical features are similar to vegetative leaves.

Anatomy of the stem (**Fig. 23-27**) reveals a clear cuticle layer in outside and in t.s. it exhibits almost a circular outline. The single layered epidermis is followed by the cortex of heterogeneous nature in respect to the size and shape of cells and is made up of more or less round to polygonal parenchymatous cells. Endodermis indistinct. The conducting tissue at the center is made up of a cylinder of radiating arms having metaxylem towards the center and protoxylem towards the arms and is surrounded by a cylinder of phloem. Parenchymatous tissues are there in between the arms of radiating xylem and in between the xylem and phloem.

Cytology: n = 136 (Ninan 1958).

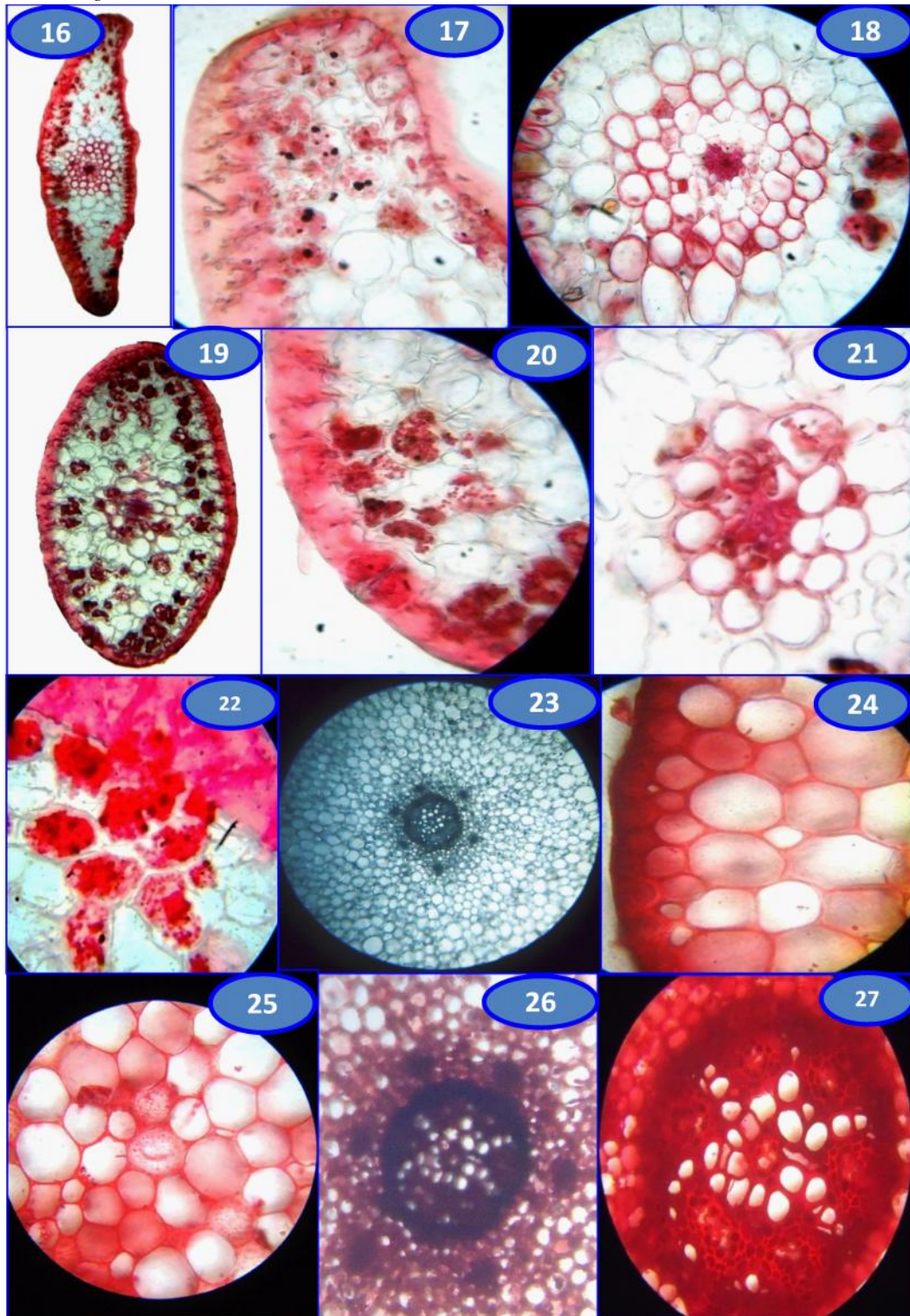


PLATE - II: *Phlegmariurus vernicosus*. Figs. 16 - 27. Internal morphological features. 16 - 18. T.s. of vegetative leaf; 19 - 22. T.s. of sporophyll; 23 - 27. T.s. of stem.

Sporulating stage: November to February.

Occurrence: Extremely rare

Distribution: SRI LANKA, INDIA: Kerela; Tamil Nadu, Assam (Gorbhanga R/F, **present report**).

RET Status: Extremely rare in India (Dixit 1987).

Note: The plant is a drooping epiphyte on large trees deep inside semi-deciduous forest. Stem *ca* 30 – 80 cm long and repeatedly dichotomously branched. Leaves and sporophylls are deep green, shining, vernicose, reflexed downward from top to bottom, reflection prominent at base of leaves. Presence of ligule in the species has not been reported in earlier descriptions. The present authors added the anatomical and ligule features.

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- 588 *Phlegmariurus vernicosus* - a new record for Northeast India
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