

***Frullanoides tristis* (Steph.) Van Slageren**
A new Addition to
East Himalayan bryoflora

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Abstract – *Frullanoides tristis* (Steph.) Van Slageren, an epiphytic species, is described from Meghalaya, eastern Himalayas, India. It is the only known species of the genus *Frullanoides* in India. Earlier this species was described from south India; the present study has extended its distribution to eastern Himalayas. *Frullanoides tristis* is characterized by 13 longitudinal rows of larger cortical and 29-30 longitudinal rows of smaller thin walled, medullary cells in the stem; leaf lobules 1/2 as long as the lobe, free margin with 7-9 small, 2-3(-4) celled long tooth, and about 10 keeled perianth.

Bryophyta/ liverwort/ *Frullanoides tristis*/ new addition/ Meghalaya/ eastern Himalayas

INTRODUCTION

The history of genus *Brachiolejeunea* (Spruce) Schiffn. on the Indian sub-continent dates back to Mitten (1861), who described the genus under the name *Lejeunea infuscata* Mitt., from Sikkim and Khasi Hills in eastern Himalayas. Subsequently the genus is variously treated by many workers (Stephani, 1912; Schiffner, 1932; Verdoorn, 1934; Chopra, 1938; Parihar, 1961-62; Parihar *et al.* 1994; Mizutani, 1961, 1989; Schuster, 1963, 1980). Van Slageren (1985) treated three subgenera i.e. *Brachiolejeunea*, *Plicolejeunea* and *Trocholejeunea* of genus *Brachiolejeunea* (Spruce) Schiffn. at the generic rank, conserving the subgeneric name except that of subgenus *Plicolejeunea* which has been considered as genus *Frullanoides* Raddi. *Frullanoides* is represented in India by only single species, *F. tristis* (Steph.) Van Slageren, which was described by Awasthi and Srivastava (1988) from south India. During a recent study on the collections made from various localities of West Khasi Hills, Meghalaya, plants closely resembling to *Frullanoides tristis* have been encountered. This is a new additional record to the bryoflora of eastern Himalayas.

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MATERIALS AND METHODS

Pure populations of plants were collected in September, 2000 from the localities of Nongstoin: Mawaiban and Mawkadiang, (West Khasi Hills), a heavily moist region in Meghalaya. The specimens were critically studied and the line drawing illustrations were made with the help of Camera Lucida (Olympus, Tokyo- 203954). Voucher specimens have been deposited in Bryophyte Herbarium, National Botanical Research Institute, Lucknow (LWG).

TAXONOMIC OBSERVATION

Frullanoides tristis (Steph.) Van Slageren, Meded. Bot. Mus. Herb. van de Rijks Univ. Utrecht **544**: 110 (1985) (Figs 1-15, Fig. 16)

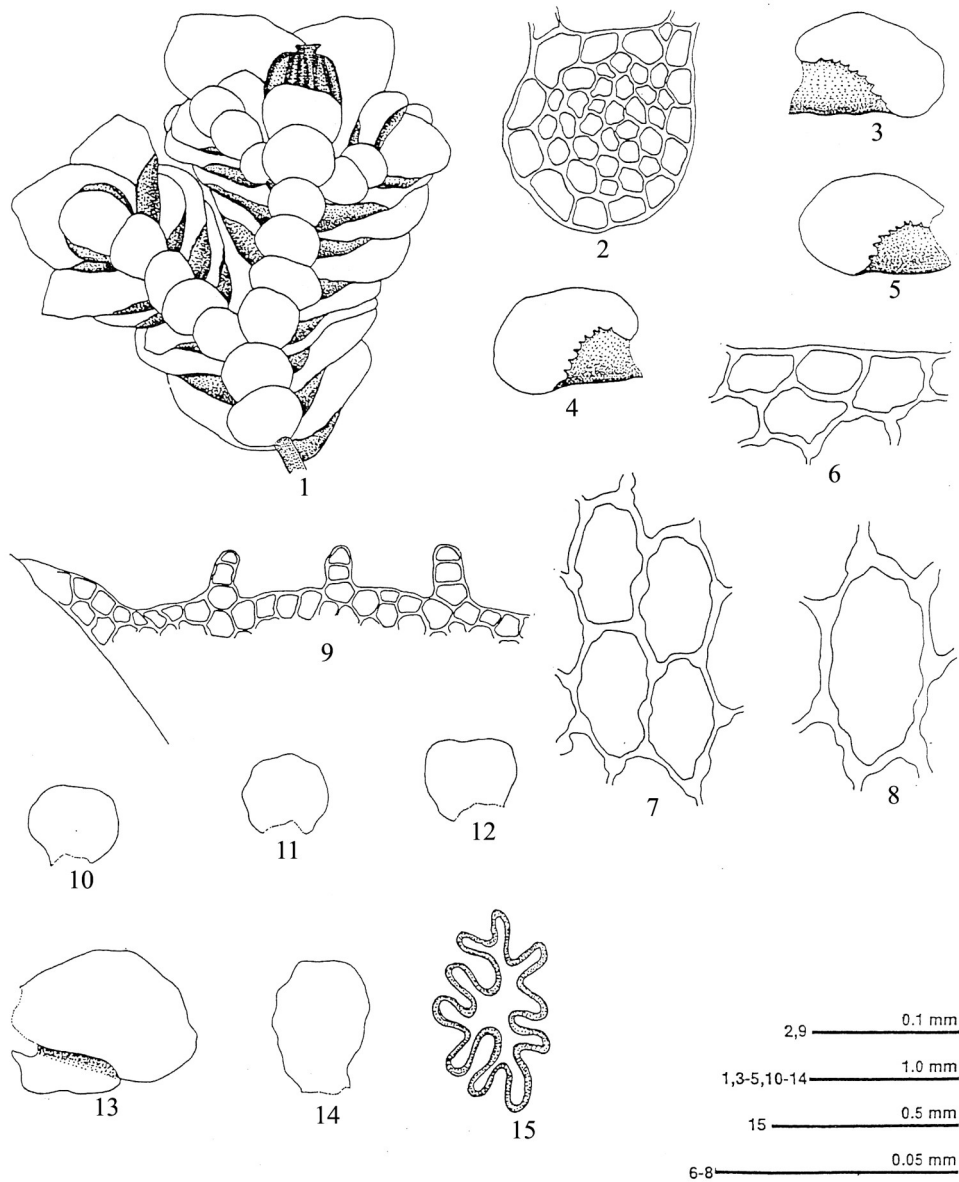
Dioicous. Plants greenish brown, robust, prostrate, 20 mm long and 1.75 mm wide including leaves, irregularly branched, branches of *Jubula* type or occasionally with *Frullania* type. Stem 0.13-0.15 mm in diameter and 8 cells across; cortical cells in 13 longitudinal rows of cells, 17.5-20 × 30-37.5 µm, thin or slightly thick walled; medullary cells in 29-30 longitudinal rows, 15-17.5 × 20-22.5 µm, thin walled, smaller than cortical cells; ventral merophytes of the stem 4 or 5 cells wide. Rhizoids few, pale brown. Leaf lobes imbricate, obliquely spreading, slightly squarrose, 0.85-1.0 mm long and 0.70-0.75 mm wide, widely ovate, entire, apices obtuse; leaf marginal cells 10-12.5 × 12.5-17.5 µm, trigonous, thin or slightly thick walled; median cells 15-17.5 × 25-35 µm, trigonous, thin walled with intermediate thickenings; basal cells 22.5-25 × 42.5-45 µm, trigonous, thin walled with intermediate thickenings; cuticle smooth; leaf lobules triangular, about 1/2 as long as the lobe, apex obliquely truncate, free margin with 7 to 9 small teeth, tooth 2 or 3 (rarely 4) celled long, lobules 0.48-0.50 mm long and 0.26-0.34 mm wide. Underleaves imbricate or approximate, rotund, 0.52-0.57 mm long and 0.60-0.62 mm wide, margin entire, subtransversely inserted. Perianth terminal on stem with 2 subfloral innovations, innovation of *Jubula* or occasionally with *Frullania* type; bracts usually 2, oblong-ovate, 1.25-1.30 mm long and 0.63-0.88 mm wide, margin entire, or undulate, apex obtuse, lobules oblong, about 1/2 more as long as the lobe, entire, ligulate; bracteoles usually one, rotund, 0.8-1.0 mm long and 0.56-0.63 mm wide, margins entire or undulate. Perianth 0.66-0.70 mm long and 0.50-0.57 mm wide, keels about 10, irregular knot like, beak short.

Distribution and ecology: North Eastern Himalaya: Meghalaya: West Khasi Hills: Nongstoin: Mawaiban, Mawkadiang.

Plants grow on bark in association with *Frullania neurota*, *F. ericoides*, *Lopholejeunea subfusca*, between 4500-4900 ft altitude, 22.5-26.3°C temperature and 61-70% relative humidity.

Range: India.

Specimens examined: India: Meghalaya: West Khasi Hills: Nongstoin: near F.R.H. Mawaiban, 14.09.2000, leg. A.P. Singh, 208537-A (LWG); Mawkadiang, 17.09.2000, leg. A.P. Singh, 208671-A (LWG). Det. V. Nath, A.P. Singh and A.K. Asthana.



Figs 1-15. *Frullanoides tristis* (Steph.) Van Slageren (LWG 208537-B). **1.** Plant ventral view; **2.** Cross-section of stem; **3-5.** Leaves; **6.** Leaf marginal cells; **7.** Leaf median cells; **8.** Leaf basal cells; **9.** Leaf lobule; **10-12.** Underleaves; **13.** Female bract; **14.** Female bracteole; **15.** Cross-section of perianth.

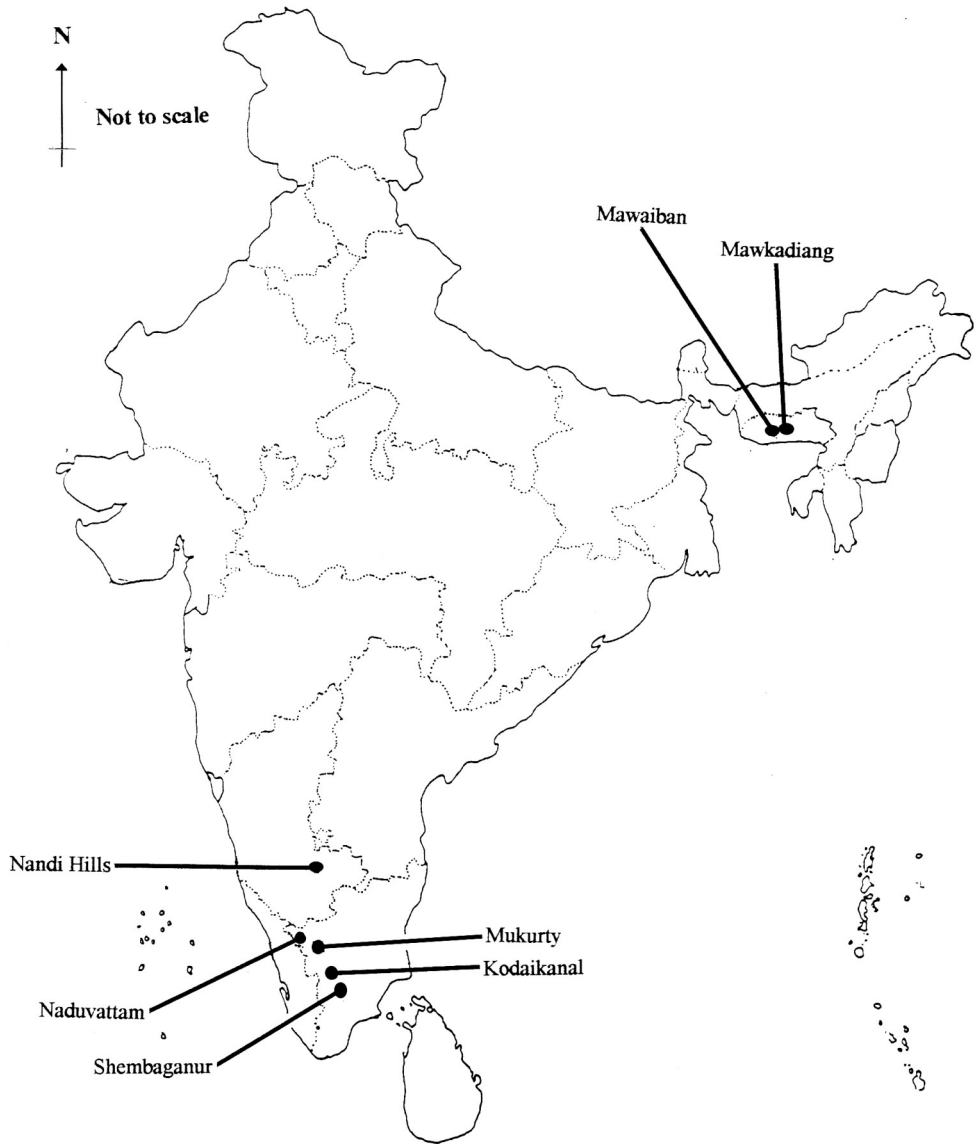


Fig. 16. Distribution of *Frullanoides tristis* (Steph.) Van Slageren in India.

DISCUSSION

Schuster (1963, 1980), while splitting the complex genus *Brachiolejeunea* (Spruce) Schiffn. into three subgenera (*Brachiolejeunea* (Spruce) Schiffn., *Plicolejeunea* Schuster and *Trocholejeunea* (Schiffn.) Schuster), emphasized that there were few contrasting stable characters among them. Van Slageren (1985) considered these characters useful and raised the subgenera of Schuster (1963, 1980) to the generic level. He raised the subgenus *Plicolejeunea* to generic rank as *Frullanoides* Raddi and also considered the other two subgenera as distinct, individual genera, *Brachiolejeunea* and *Trocholejeunea*. In a work on the status of *Brachiolejeunea* (Spruce) Schiffn. in India, Awasthi and Srivastava (1988) remarked that *Frullanoides* and *Trocholejeunea* are closely related as they do not possess sufficient contrasting stable characters, and therefore subject to controversy until more information in this regard is provided. However, Gradstein (1994) and Gradstein *et al.* (2003) delimited *Trocholejeunea* as a distinct genus on the basis of their total lack of blackish secondary pigmentation, *Frullania*-type innovation, scarcely swollen epistatic male bracts, and non-articulate seta made up of more than 20 cell rows. In view of the above elevation of the subgenus *Plicolejeunea* to generic rank *Frullanoides*, the treatment of Van Slageren (1985) and Gradstein *et al.* (2003) has been followed. The present study is based on plants collected near F.R.H. Mawaiban and Mawkadiang, Nongstoin in West Khasi Hills (Meghalaya), that add *Frullanoides tristis* to eastern Himalayas, India (Fig. 16). The taxonomic observations on the plants from Meghalaya show slight variation in the diameter of leaf cells and perianth as compared to the plants which was earlier described from south India. These variations are considered to be due to alteration in ecological conditions.

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LITERATURE CITED

- AWASTHI U.S. & SRIVASTAVA S.C., 1988 — Status of *Brachiolejeunea* (Spruce) Schiffn. in India. *Proceedings of the Indian Academy of Sciences (Plant Science)* 98 (1): 12.
- CHOPRA R.S., 1938 — Notes on Indian Hepatics II, Sikkim Himalaya and Bengal. *Proceedings of the Indian Academy of Sciences Series B*, 7: 427-439.
- GRADSTEIN S.R., 1994 — Lejeuneaceae: Ptychantheae, Brachiolejeuneae. *Flora Neotropica Monograph* 62, 217 p.
- GRADSTEIN S.R., REINER-DREHWALD M.E. & SCHNEIDER H., 2003 — A phylogenetic analysis of the genera of Lejeuneaceae (Hepaticae) *Botanical Journal of the Linnean Society* 143 (4): 391-410.
- MITTEN W., 1861 — Hepaticae Indiae Orientalis, an Enumeration of the Hepaticae of the East Indies. *Botanical Journal of the Linnean Society* 5: 89-128.
- MIZUTANI M., 1961 — A revision of Japanese Lejeuneaceae. *Journal of the Hattori Botanical Laboratory* 24: 115-302.

- MIZUTANI M., 1989 — Notes on the Lejeuneaceae. 15. Three species of the genus *Trocholejeunea*. *Journal of the Hattori Botanical Laboratory* 66: 271-281.
- PARIHAR N.S., 1961-62 — *An annotated revised census of Indian Hepatics*. Allahabad University Studies (Botany Section). Allahabad, Senate House, 56 p.
- PARIHAR N.S., LAL B. & KATIYAR N., 1994 — *Hepatics and Anthocerotae of India. A new annotated checklist*. Allahabad, Central Book Depot, 107 p.
- SCHIFFNER V., 1932 — Bryophyta nova 2. *Annals of Bryology* 5: 160-162.
- SCHUSTER R.M., 1963 — An annotated synopsis of the genera and subgenera of Lejeuneaceae. I. *Nova Hedwigia, Beihefte* 9: 1-203.
- SCHUSTER R.M., 1980 — *The Hepaticae and Anthocerotae of North America. East of the Hundredth Meridian* 4. New York, Columbia University Press, 802 p.
- STEPHANI F., 1912 — *Brachiolejeunea*. In: *Species Hepaticarum* 5 : 110-142. Geneve.
- VAN SLAGEREN M., 1985 — A taxonomic monograph of the genera *Brachiolejeunea* and *Frullanoides* (Hepaticae), with a SEM analysis of the sporophyte in the Ptychanthoideae. *Mededeelingen van het Botanisch Museum en Herbarium van de Rijks Universiteit te Utrecht* 544: 1-205.
- VERDOORN F., 1934 — Résultats de l'expédition scientifique néerlandaise à la Nouvelle-Guinée. Lejeuneaceae Holostipae. *Nova Guinea* 18: 1-8.