

## **BRYOCRUMIA MALABARICA SPEC. NOVA (BRYOPHYTA, HYPNACEAE), A SECOND SPECIES OF THE GENUS FROM THE WESTERN GHATS OF INDIA**

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A new species similar to *Bryocrumia vivicolor*, the only known species in the genus *Bryocrumia*, is described as *Bryocrumia malabarica* spec. nova from the Malabar Wildlife Sanctuary in the Western Ghats of Kerala in Peninsular India. It resembles *Homalia* in external appearance and was collected in a rheophytic habitat along a stream channel in the evergreen forest. The new species is characterised by closely arranged leaves with distinct tricostate, ovate-rounded to truncate leaves, upper margin of leaf rounded with fine serrations and an inconspicuous central strand in stem cross section.

Key words: Hypnaceae, Kerala, rare, rheophyte, Western Ghats

### INTRODUCTION

The genus *Bryocrumia* L. E. Anderson remains an enigmatic taxon in most parts of its range with widely disjunct occurrences in Asia, Africa and North America. It is rarely collected so very few specimens are available for study in herbaria, with most collections only with gametophytes. Probably due to the rheophytic habit, it rarely produces capsules. The sporophytic structure of this genus was determined only recently (Ma *et al.* 2016), which is over 100 years since its original description (Dixon 1914). The genus *Bryocrumia* was established by Anderson (1980) based on *Glossadelphus andersonii* E. B. Bartram (1951). *G. andersonii* was then transferred to *Taxiphyllum* as *T. andersonii* (E. B. Bartram) H. A. Crum (1965), and later to *Bryocrumia* as *B. andersonii* (E. B. Bartram) L. E. Anderson (1980). The other species was first described as *Taxithelium vivicolor* Broth. et Dixon (Dixon 1914) from the Western Ghats of India. It was later transferred to *Glossadelphus* as *G. vivicolor* (Broth. et Dixon) Broth. (Brotherus 1925), and finally to *Bryocrumia* as *B. vivicolor* (Broth. et Dix-

on) W. R. Buck (1987). Taxonomy and delimitation of closely related taxa such as *Glossadelphus* M. Fleischer, *Taxiphyllum* M. Fleischer, *Taxithelium* Spruce ex Mitt., *Phyllodon* Schimp. and *Bryocrumia* L. E. Anderson may appear as ambiguous at times. However, O'Shea and Buck (2001) clearly delimited them.

The genus *Bryocrumia* remained as monotypic since 1987, as *B. andersonii* was reduced to a synonym of *B. vivicolor* by Buck (1987). It is known from India (Maharashtra, Tamil Nadu, Kerala), Sri Lanka (Nuwara Eliya), China (Yunnan), Africa (Zaire, Uganda) and America (North and South Carolina) (Ma *et al.* 2016, O'Shea and Buck 2001, Prajitha *et al.* 2017).

The Malabar Wildlife Sanctuary is situated in the Western Ghats of Kozhikode District of Peninsular Indian state of Kerala, with an area of 74.21 km<sup>2</sup>, between 11° 75' and 11° 76' North latitude and 76° 20' and 75° 38' East longitude. It holds all major vegetation types of southern India such as West-coast Tropical Evergreen, West-coast Semi Evergreen, Southern Moist Mixed Deciduous, Southern Hill-top Evergreen forests, and Grasslands. During recent bryological explorations in the Malabar Wildlife Sanctuary, the first three authors obtained some specimens resembling *Bryocrumia*. Careful examination proved it as another species of *Bryocrumia* and it is described here as a new species.

## MATERIAL AND METHODS

The plants collected were observed in both dry and moist conditions using an Olympus SZX7 Trinocular stereo Microscope and Olympus compound microscope CX-21i LED. Light microscope photos were taken on a Magcam DC-10 Camera.

## TAXONOMY

*Bryocrumia malabarica* Manju, Prajitha, Prakashkumar et W. Z. Ma,  
*spec. nova*  
(Fig. 1)

Type: India. Kerala: Malabar Wildlife Sanctuary, Kakkayam, Ambalappara (650 m), 11.09.2014, *Prajitha 11036*. (Holotype: CALI; Isotypes: MBGH, ZGC).

Description. Plants light green, glossy, tufted, primary and secondary stems prostrate, 2 cm long and 2–2.4 mm wide with leaves moderately complanate-foliate, branches simple; stem epidermal cells small, distinct outer and inner cortex, outer walls thick, in 2–3 rows, larger, 5–8 µm wide, thinner inner wall 6–8 cells across, 9–25 µm wide, few cells forming an inconspicuous central strand; leaves closely arranged on the stem, simple, soft, 0.5–0.8 mm long, 0.4–0.6 mm wide at upper region and 0.15–0.2 mm wide at extreme

base of leaf, *Homalia*-type leaves, ovate-rotund, upper margin of leaf rounded or sometimes truncate with fine serrations, middle and basal margin entire, leaves asymmetric with prominent tricosta on all leaves, ending below half of leaf, not plicate when dry; leaf cells smooth, 1–2 layers of apical marginal cells very shorter,  $10\text{--}15 \times 6\text{--}8 \mu\text{m}$ , cells in upper half of leaf quadrate to rhomboid,

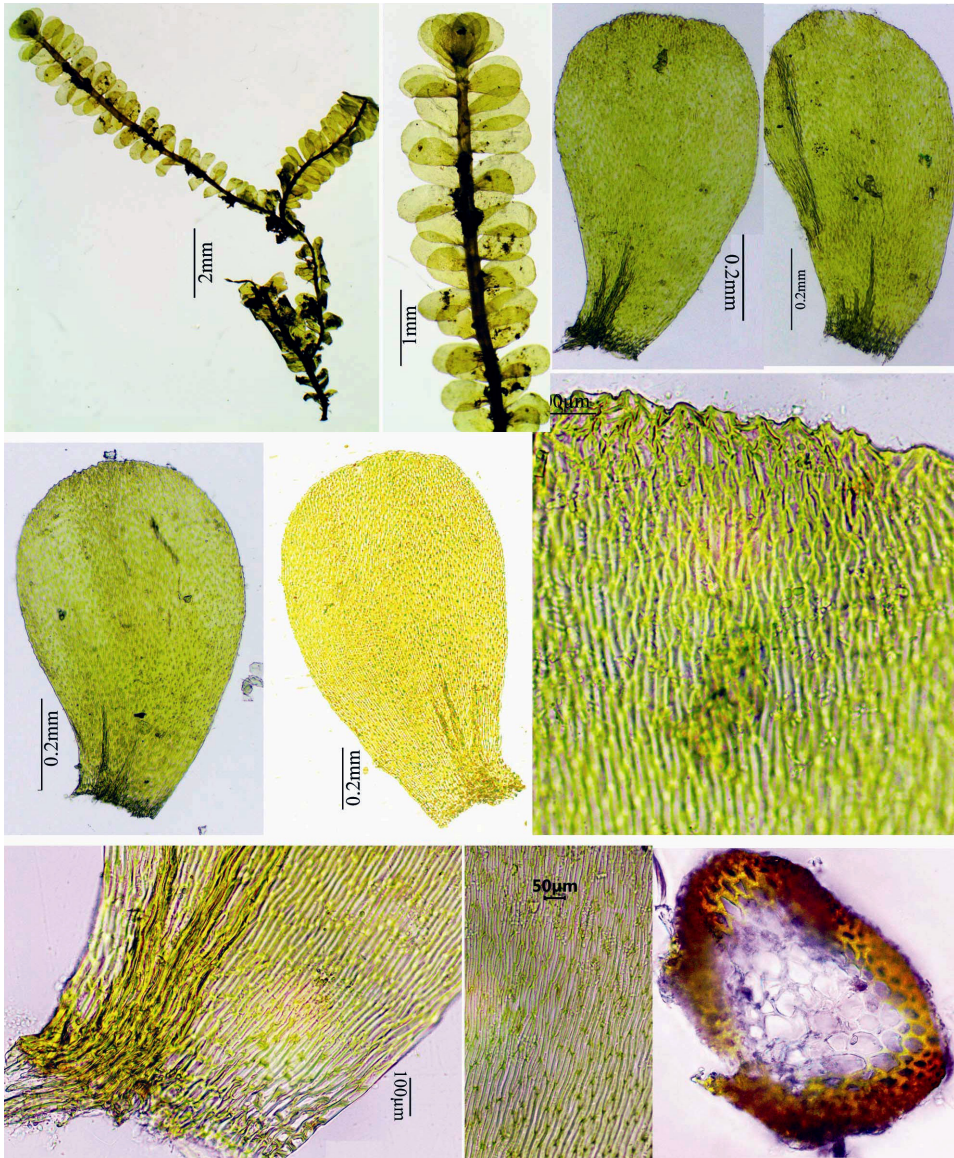


Fig. 1. *Bryocrumia malabarica*, spec. nova – a = habit; b = branch; c–f = leaf showing trinerves; g = leaf tip marginal cells; h = leaf base with trinerve; i = leaf middle cells; j = cross section of stem

middle cells  $26\text{--}42 \times 5\text{--}7 \mu\text{m}$ , those near costa rectangular,  $6 \times 16 \mu\text{m}$ , alar cells distinct, occurring at the extreme basal region in 2–5 rows,  $5\text{--}6 \times 38\text{--}40 \mu\text{m}$ ; reproductive structures not observed. Sporophyte unknown.

Diagnostic characters. *Brocrumia malabarica* looks similar to the members of *Homalia* in morphology, but *Bryocrumia* has its own characters to separate it from the family Neckeraceae. The present species shows similarity with *Bryocrumia vivicolor*, the only species known previously in this genus. The plants look similar in morphology to *B. vivicolor*, with primary and secondary branches prostrate with very short secondary branches, leaves of the two species are similar in shape such as ovate to rotund and the leaf cells are elongate-rhomboidal. But *B. malabarica* shows specific characters to separate it from *B. vivicolor* such as distinct tricostate leaves compared to the indistinct bicostate leaves of *B. vivicolor*. In *B. malabarica* the leaves are asymmetric with three distinct costae on one half of the leaf. But in *B. vivicolor* the two costae occur at the centre of the insertion. In *B. malabarica* the leaves are arranged parallel to the stem and are distant compared to the closely arranged leaves in *B. vivicolor*. The leaf apex is rounded to elongate in *B. vivicolor*, but in *B. malabarica* it is flat with a rotund serrate upper margin. In *B. malabarica* the stem has an inconspicuous central strand which is absent in *B. vivicolor*.

Etymology: The specific epithet is derived from the well-known phyto-geographical region of the past, Malabar, referring to the Western Ghats of India. The Malabar Wildlife Sanctuary of Kozhikode District in Kerala state of India is named after the erstwhile Malabar.

Distribution and ecological notes: This species is known from two localities in Malabar Wildlife Sanctuary. It was found on a rocky patch on a streamside along with *Pelekium velatum* Mitt. where water flows regularly at an altitude of 600–700 m in evergreen forests.

Additional specimen examined: India, Kerala, Kozhikode District, Malabar Wildlife Sanctuary, Kakkayam, Ambalappara (650 m), *Prajitha 12560*. (MBGH, ZGC).

#### Key to the species of *Bryocrumia*

- 1a Leaves distinctly tricostate on one half of leaf; stem with an inconspicuous central strand *B. malabarica*
- 1b Leaves indistinctly bicostate or with no visible costa at the centre of the leaf; stem lacking central strand *B. vivicolor*

## DISCUSSION

The members of *Bryocrumia* are easily mistaken for members of the genus *Homalia*, due to the morphological resemblance. However, species of *Bryocrumia* could be distinguished by their rheophytic habitat preferences. The characteristic distinct tricosta on all leaves and an inconspicuous central strand in stem cross section aids in its identification. The only other species of the genus, *B. vivicolor*, also appears rare but that may be due to its specialised microhabitat and collecting activity in such environments. Ma *et al.* (2016) documented the sporophyte of this rare species for the first time. We have also mistaken the present species for *Homalia* sp. in its fresh habit, and after more than four years determined that it is a different genus. This genus is also morphologically similar to *Glossadelphus* and *Phyllodon*. The genus *Bryocrumia* was separated from *Glossadelphus* and *Taxiphyllum* by Anderson (1980), and subsequently Buck (1987) separated *Phyllodon*, pointing out that *Glossadelphus* was a synonym of *Phyllodon*, and thus species currently in *Glossadelphus* should either be moved into *Phyllodon*, or transferred elsewhere (Goffinet *et al.* 2009). There is controversy regarding the placement of *Bryocrumia* along with *Phyllodon* under the family Symphyodontaceae. But more recent discovery of the sporophyte of the single species *Bryocrumia vivicolor* by Ma *et al.* (2016) shows that the *Bryocrumia* has typical hypnoid peristome teeth, a short operculum, and slightly collenchymatous exothecial cell walls and therefore the capsule of *B. vivicolor* conforms to the basic definition of Hypnaceae.

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