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## *Fissidens brevinervis* BROTH. – New to the Indian Moos Flora

UWE SCHWARZ<sup>1</sup>

<sup>1</sup> *Prestige Grand Oak 202, 7th Main, 1st Cross, HAL IInd Stage, Indira Nagar, Bangalore 560038, India, schwarzu@lumot.de*

**Abstract:** Schwarz, U. (2014): *Fissidens brevinervis* BROTH. – New to the Indian Moss Flora. *Frahmia* 3:1-6.

*Fissidens brevinervis* BROTH. was found in Bangalore, Karnataka, India in 2013. It's the first record for India and extends the distribution range of this species that was only known so far from China and Indonesia. A brief summary of the current status of the bryophyte flora of Bangalore and the *Fissidens* species of India are provided.

### 1. Introduction

During the investigation of the bryophyte flora of the state of Karnataka, India several parks in Bangalore were visited and checked for their bryophyte flora.

Bangalore, the capital of the state of Karnataka, is located in southern India on the Deccan Plateau at an elevation of approximately 910 meter. Due to its elevation Bangalore enjoys a more moderate climate throughout the year but with a distinct wet and dry season. The annual precipitation reaches 975 mm per year. Coolest month is December with around 15 °C, hottest month is April which can reach to 36 °C.

The population of around 10 million makes it the third most populated city in India. As a highly populated area with a high degree of urbanization the locations that allow bryophytes to develop is rather limited. Parks and cemeteries are the usual places where a reduced bryophyte flora can emerge. Trees along the roads can sometimes also held epiphytic bryophytes.

The bryophyte flora of Bangalore is poorly known. Based on BAPNA & KACHROO (2000a, 2000b) and SCHWARZ (2013) there are only 3 mosses (*Barbula indica* (HOOK.) SPRENG., *Fissidens flaccidus* MITT., *Hyophila involuta* (HOOK.) A. JAEGER), 4 liverworts (*Fossombronia himalayensis* KASHYAP, *Metzgeria furcata* (L.) CORDA, *Pallavicinia lyellii* (HOOK.) GRAY, *Riccardia levieri* SCHIFFNER) and 1 hornwort species (*Folioceros mangaloreus* (STEPHANI) D.C. BHARDWAJ) recorded from Bangalore.

*Brachymenium exile* (DOZY & MOLK.) BOSCH & SANDE LAC., *Bryum argenteum* HEDW., *Fissidens bryoides* HEDW., *Fissidens diversifolius* MITT. and *Fissidens kurzii* MÜLL. HAL. were meanwhile also collected from locations in Bangalore. Several specimens of *Brachymenium*, *Cephaloziella*, *Epidium*, *Fabronia*, *Lophocolea*, *Porella*, and *Riccia* have yet to be identified.

Amongst the specimen collected in Cubbon Park one *Fissidens* species was identified as *Fissidens brevinervis* BROTH. It was found for the first time in India.

## 2. Overview of the *Fissidens* Species in India

The *Fissidens* flora of India is rich and highly divers. So far 76 valid species, 1 subspecies and 9 varieties have been recorded. Some of them are only known from a few collections and might be synonymized in future. The judgement of the scientific rank will also cause major challenges to the researcher. Therefore numbers for India can only be indicative.

The following list contains the *Fissidens* species known from the Indian subcontinent. Taxa marked with “+” have been reported from Southern India, i.e. the states of Karnataka, Kerala and Tamil Nadu. So far 56 species, 1 subspecies and 8 varieties are known from these 3 states.

1. +*Fissidens amplifolius* DIXON & P. DE LA VARDE
2. +*Fissidens angustifolius* SULL.
3. +*Fissidens angustusculus* DIXON & P. DE LA VARDE
4. +*Fissidens anomalus* MONT.
5. *Fissidens arnigadhensis* BROTH. ex S.S. KUMAR
6. *Fissidens arunii* SRIVASTAVA & NORKETT
7. +*Fissidens asplenioides* HEDW.
8. +*Fissidens beckettii* MITT. (syn. *Fissidens curvatoxiphoides* DIXON & P. DE LA VARDE)
9. +*Fissidens biformis* MITT. (syn. *Fissidens coorgensis* BROTH.)
10. *Fissidens bilaspurensis* GANGULEE
11. +*Fissidens bryoides* HEDW.  
+*Fissidens bryoides* var. *ramosissimus* THÉR.
12. +*Fissidens carnosus* BROTH.
13. +*Fissidens ceylonensis* DOZY & MOLK. (syn. *Fissidens intromarginatulus* E.B. BARTRAM)
14. +*Fissidens crenulatus* MITT.
15. +*Fissidens crispulus* BRID. (syn. *Fissidens sylvaticus* GRIFF., *Fissidens sylvaticus* var. *zippelianus* (DOZY & MOLK.) GANGULEE, *Fissidens zippelianus* DOZY & MOLK.)  
+*Fissidens crispulus* var. *robinsonii* (BROTH.) B.C. TAN & CHOY M.-S. (syn. *Fissidens robinsonii* BROTH.)
16. +*Fissidens crispus* Mont. (syn. *Fissidens bryoides* subsp. *schmidii* (MÜLL. HAL.) NORK., *Fissidens schmidii* MÜLL. HAL.)
17. +*Fissidens curvatus* HORNSCH.
18. +*Fissidens diversifolius* MITT.  
*Fissidens diversifolius* var. *rubricaulis* (DIXON) NORK.
19. +*Fissidens dubius* P. BEAUV. (syn. *Fissidens cristatus* Wilson & MITT.)
20. *Fissidens elongatus* MITT.
21. +*Fissidens excedens* BROTH.
22. +*Fissidens firmus* MITT.
23. +*Fissidens flaccidus* MITT. (syn. *Fissidens splachnobryoides* BROTH.)
24. +*Fissidens fuscoviridis* THWAITES & MITT.
25. +*Fissidens ganguleei* NORK.
26. +*Fissidens gardneri* MITT.
27. *Fissidens geminiflorus* DOZY & MOLK.
28. *Fissidens geppii* M. FLEISCH. (syn. *Fissidens rigidiusculus* BROTH. EX GANGULEE)
29. +*Fissidens grandifrons* BRID.
30. +*Fissidens griffithii* GANGULEE
31. +*Fissidens hollianus* DOZY & MOLK. (syn.)  
+*Fissidens hollianus* var. *asperisetus* (SANDE LAC.) M. FLEISCH. (inclusive +*Fissidens asperisetus* var. *andamanensis* GANGULEE)
32. +*Fissidens hyalinus* HOOK. & WILSON (syn. *Fissidens nymanii* M. FLEISCH.)
33. +*Fissidens incognitus* GANGULEE

34. \**Fissidens involutus* WILSON ex MITT.  
\**Fissidens involutus* subsp. *curvatoinvolutus* (DIXON) GANGULEE
35. \**Fissidens javanicus* DOZY & MOLK.
36. \**Fissidens jungermannioides* Griff.
37. \**Fissidens kalimpongensis* GANGULEE
38. \**Fissidens kammadensis* MANJU, K.P.RAJESH & MADHUSOODANAN
39. \**Fissidens karwarensis* DIXON
40. \**Fissidens kurzii* MÜLL. HAL.
41. *Fissidens laxitextus* BROTH. ex GANGULEE
42. *Fissidens longisetus* GRIFF. (syn. *Fissidens alanii* GANGULEE)
43. \**Fissidens longtonianus* Z. IWATS. & TAD. SUZUKI
44. \**Fissidens lutescens* BROTH.
45. \**Fissidens macrosporoides* DIXON & P. DE LA VARDE
46. \**Fissidens macrosporus* DIXON
47. \**Fissidens microdictyon* DIXON & P. DE LA VARDE
48. *Fissidens nobilis* GRIFF.
49. *Fissidens obscurus* MITT.
50. \**Fissidens orishae* GANGULEE
51. \**Fissidens pallidinervis* MITT.
52. \**Fissidens pellucidus* HORNSCH. (syn. *Fissidens crassinervis* var. *laxus* (SULL. & LESQ.) A. EDDY, *Fissidens immutatus* DIXON, *Fissidens laxus* SULL. & LESQ., *Fissidens mittenii* PARIS)
53. *Fissidens perplexans* DIXON
54. \**Fissidens perumalensis* DIXON & P. DE LA VARDE
55. *Fissidens pokharensis* NORKETT ex KUMAR
56. *Fissidens polypodioides* HEDW.
57. *Fissidens polysetulus* MÜLL. HAL. ex NORK. & GANGULEE
58. \**Fissidens pseudofirmus* Z. IWATS.
59. \**Fissidens pulchellus* MITT.
60. *Fissidens rambii* GANGULEE
61. \**Fissidens ranchiensis* GANGULEE
62. *Fissidens ranuii* GANGULEE
63. \**Fissidens sedgwickii* BROTH. & DIXON
64. \**Fissidens semperfalcatus* DIXON
65. \**Fissidens serratus* MÜLL. HAL.
66. \**Fissidens subangustus* M. FLEISCH. (syn. *Fissidens leptopelma* DIXON)
67. \**Fissidens subbryoides* GANGULEE
68. *Fissidens subfirmus* DIXON
69. \**Fissidens subpalmatus* MÜLL. HAL.
70. *Fissidens subpulchellus* NORK.
71. \**Fissidens taxifolius* HEDW.  
\**Fissidens taxifolius* var. *auriculatus* (MÜLL. HAL.) A.E.D. DANIELS & P. DANIEL  
\**Fissidens taxifolius* var. *teraicola* (MÜLL. HAL.) A.E.D. DANIELS & P. DANIEL (syn. *Fissidens teraicola* MÜLL. HAL.)
72. *Fissidens titalyanus* MÜLL. HAL.
73. \**Fissidens virens* THWAITES & MITT.
74. *Fissidens viridulus* (SW.) WAHLENB.
75. \**Fissidens walkeri* BROTH.  
\**Fissidens walkeri* var. *elimbatus* (BROTH.) DIXON (syn. *Fissidens elimbatus* BROTH.)
76. \**Fissidens zollingeri* MONT. (syn. *Fissidens xiphoides* M. FLEISCH.)

### 3. *Fissidens brevinervis* from Bangalore

During the investigation of the bryophyte flora of Bangalore *F. brevinervis* was collected from the following location:

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India, State of Karnataka, Bangalore Urban District, Cubbon Park, North to Queen Victoria Statue, 12° 58' 39" N, 77° 35' 50" E, on bark, leg. U. Schwarz, August 5, 2013, det. M. Bruggeman-Nannenga, Herbarium U. Schwarz, No. 11190

Description:

*Plants* yellowish green, 1.8 – 2.9 mm high and 1.0 – 1.6 mm wide, with 7-9 pairs of leaves, lower leaves gradually increasing in size towards the upper stem. *Stem* simple, oval in cross section, 80 – 110 µm in diameter, cortical stem cells thick walled, 6 – 8 µm x 6 – 15 µm, inner cells thin walled 9 – 17 µm x 10 – 19 µm, central strand missing or very weakly developed, slightly developed hyaline nodules present. *Leaves* elongated oval, wedge shaped at dorsal lamina, slightly obtuse to widely acute, 0.25 – 0.3 mm x 0.6 – 1.0 mm, not decurrent, margin finely serrulate, lamina unistratose. *Vaginant lamina* equal, reaching 2/3 of the leaf length, limbidia lacking to slightly developed as 1 – 2 intermitting rows of short rectangular cells. *Costa* ending 8 – 14 cells before the leaf apex, 35 µm wide at the base slightly thinner towards the apex, considerably longer than the vaginant lamina. Inner cells of the costa 1 – 2 in upper part, 9 – 13 µm x 8 – 11 µm, 3 inner cells in vaginant area. Costa covered by 4, lamina-like cells on both sides from the leaf base to the apex.

*Cells* at leaf base quadrate to rectangular 4 – 7 long µm and 5 – 7 µm wide, at mid leaf quadrate to polygonal 5 – 8 long µm and 5 – 8 µm wide, at leaf apex 6 – 8 long µm x 6 – 9 µm wide. All leaf cells with 3 – 4 papillae on both sides, in vaginant area only on the outer surface, papillae located towards the cell walls. *Sporophytes* not developed.

Ecology:

Cubbon Park was created in 1870 with a high number of its original trees still in place. *F. brevinervis* grew on an old, tall tree with the trunk approximately 50 cm in diameter. Even though trees are rather scattered the wide canopies lead to an almost completely shaded environment at the locality.

#### 4. Discussion

*Fissidens brevinervis* was synonymized by PURSELL et al. (1993) synonymized *F. gardneri* MITT. SUZUKI & IWATSUKI (2010) however reinstated it as a distinct species.

PURSELL (1984 and 1994) mentioned and depicted some characters that are characteristic for *F. gardneri* but can't be found in *F. brevinervis*. He shows *F. gardneri* leaves where the dorsal lamina ends above or close to the leaf base. The costa ends only slightly beyond the distal end of the vaginant lamina – characters that haven't been observed in the collection from India. Unfortunately he doesn't mention the quite characteristic, lamina-like cells that cover the costa.

IWATSUKI (1980) described *F. brevinervis* in more detail and provided very good drawings. He mentioned that the species is closely related to *F. elegans* but indicated that the multipapillose cells, which are similar to the lamina cells and covering the costa are most characteristic. He also proposed to put *F. brevinervis* to Sect. *Semilimbium* even though he couldn't find borders on the leaves. In some cases *Fissidens* species only develop a limbidium at the perichaetial leaves.

LI (1985) took a similar species concept and characterized *F. brevinervis* by the oblong-lingulate leaves with obtuse to rounded apices, the wedge-shaped base of the dorsal lamina, the extremely obscure costa ending far below the leaf apex, and the obscure pluripapillose lamina cells.

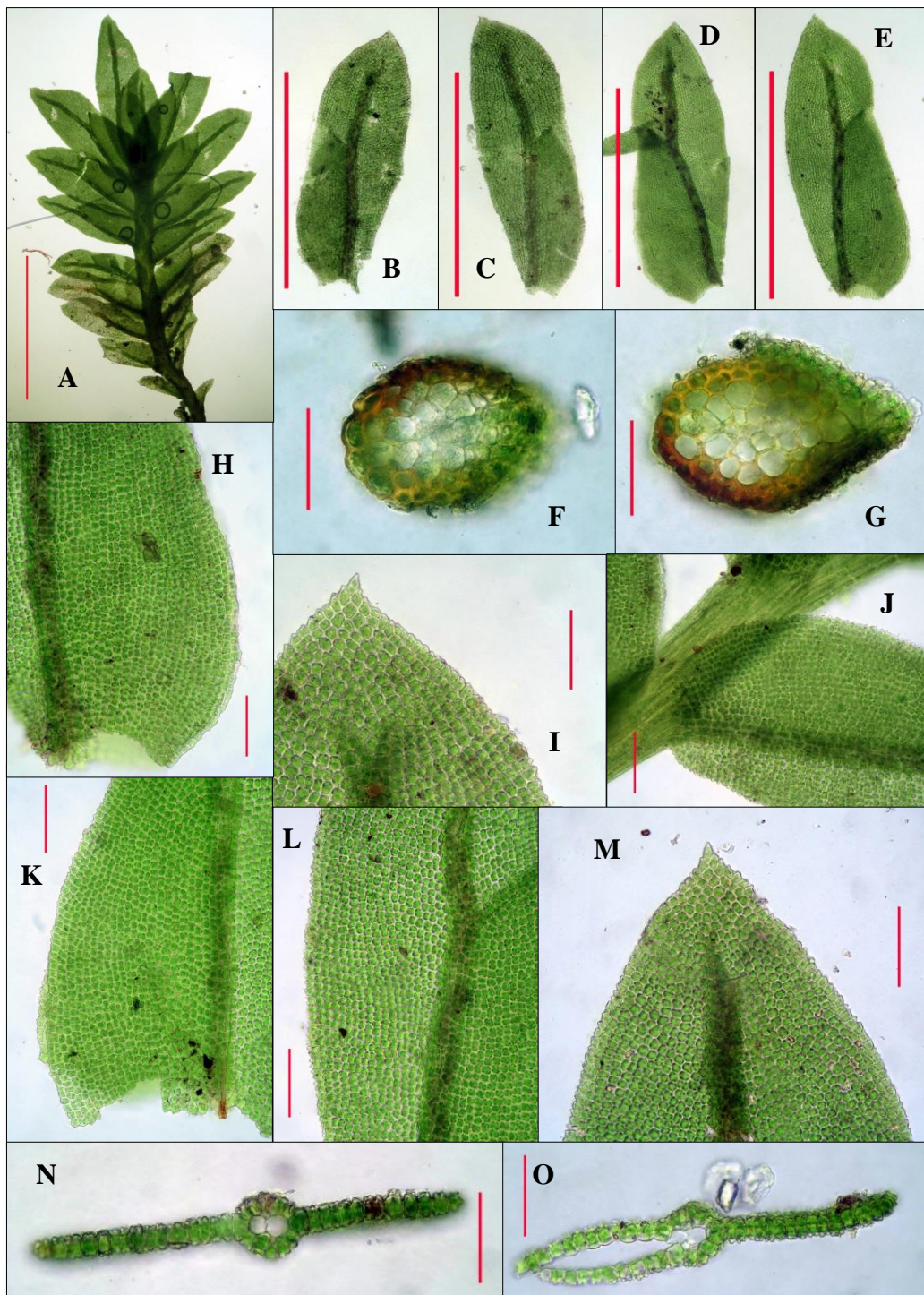


Plate 1: A Plant, B – E Leaves, F-G Stem Cross Section, H Leaf Base, I, M Leaf Apex, J Stem, K Base of Vaginant Lamina, L Mid Leaf, N – O Leaf Cross Section (Scale: A: 1 mm, B – E: 0.5 mm, F – O: 50 µm) All from Herbar U. Schwarz, No. 11190.

Even though LI mentioned the lamina-like cells that cover the costa she did not stressed this as a characteristic feature.

IWASTUKI (1982) as well as LI (1985) were both relating to the holotype and isotype collections made by Handel-Mazzetti on bark in Chinas Sichuan province. LI (1992) considered *F. brevinervis* as an endemic species to China. SUZUKI & IWATSUKI (2010) extended the distribution eastwards to Indonesia, whereas the current collection extends the range westwards to India.

The appearance of *F. brevinervis* in an urban area like Bangalore might indicate that the species could be found more often in similar, semi-natural locations.

## 5. Acknowledgments

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