



## STUDIES ON INDIAN MOSSES

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### Abstract

Important morphological characters of some of the rarely occurring Mosses of South India have been described. The species studied are *Ditrichum flexicaule* var. *linifolia* var. nov., *Dicranum indicum* var. *lancifolia* var. nov., *Campylopus linearis* var. *nilgiriensis* var. nov., *C. linearis* var. *albicans* var. nov., *Fissidens grandifolia* sp. nov., *F. barbuloides*, *Barbula athanurensis*, *B. kalrayensis* var. *keralensis*, *B. kalrayensis* var. *lobata*, *Pottia valparaiensis*, different forms of *Bryum ramosum*, *Physcomitrella athanurensis* var. *linifolia*, *Physcomitriopsis pygmaea*, *Pseudoleskeae perfalcata* and *P. perfalcata* var. *ovalifolia*.

**Key words :** Mosses of South India, taxonomical studies, important characters.

### Introduction

Indian climatic conditions are suitable for the occurrence of diverse forms of Mosses. There are more than 2000 species of Mosses in India alongwith many hundred varieties and forms. So far less than 20 to 30% of Mosses are known to Indian Bryologists. The remote and dangerous areas of Western Ghats and Eastern Ghats of Southern India and Himalays of Northern parts of India have not been so far thoroughly studied excepting some fragmentary reports. Therefore, the present study is an attempt to describe as many rare species of Mosses as possible. For the first time, Srinivasan (1974) has studied the physiological, anatomical and morphological features of 64 species from Ooty and Kodaikanal.

### Materials and Methods

Mosses were collected from wet brick walls of various places of Cuddalore and Coimbatore districts of Tamil Nadu and on tree trunks under thick forests near Coonoor of Nilagiri hills.

The plant parts were studied under 20 × power dissection microscope and 100 × and 250 × powers of compound research microscope. Camera lucida diagrams were drawn at all magnifications. All the observations and illustrations were made by the author.

3 sets of herbaria for each type of plant were prepared. The collection numbers were given and the isotypes were kept with author's home laboratory at 277, I South Cross Road, Mariappanagar, Annamalai Nagar

– 608 002 (Tamil Nadu), India and holotypes were deposited at Botanical Survey of India (B.S.I.) at Coimbatore (CBE), Southern Circle, Tamil Nadu (Tamil Nadu), India.

The author citation so far made for the author's findings of new species has been reduced here afterwards from D. Subramanian as D.S.

### Observations and Discussion

#### I. Ditrichaceae

##### 1. *Ditrichum flexicaule* Hook. var. *linifolia* var. nov. (Plate 1)

This is an epiphyte on tree trunks under thick forests near Coonoor, Nilagiri Hills. The basal part of the plant with a few and smaller leaves, but the tip portion enlarged with larger leaves, more crowded; leaves linear lanceolate, thick walled cells forming central core, and on either side cells with thin walls. The author has already described *Ditrichum defficile* (Ther & Mitt.) Par. *D. flexicaule* Hook; *D. tortipus* (Mitt.) Par and *D. amoenum* (Thwait & Mitt). Par. in his book "Studies on Indian Mosses" (In Press). The present plant is different from them in general morphology of the plant and thick central core forming midrib.

Collection No. 1028, Holotype No. 184; dated 15.10.2015 at B.S.I., CBE, TN and Isotype No. 2212 at author's home laboratory.

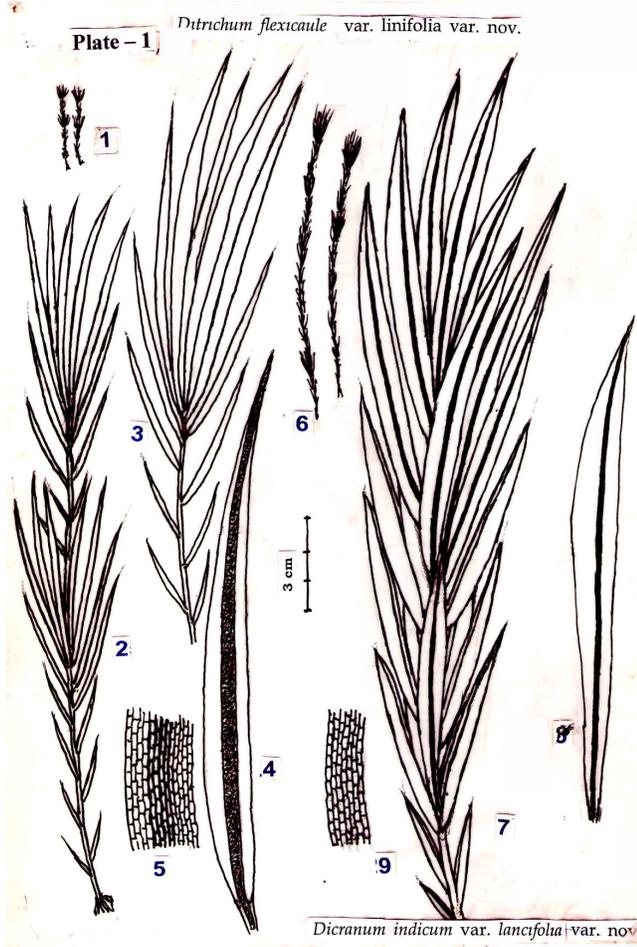


Plate 1 :

Figs. 1 to 5 = *Ditrichum flexicaule* var. *lanceolatus*.

Fig 1 = plants  $\times 1$ ; 2 = A plant enlarged  $\times 20$ ; 3 = portion of plant enlarged  $\times 50$ ; 4 = A leaf  $\times 100$ ; 5 = Laminar cells  $\times 250$ .

Figs. 6 to 9 = *Dicranum indicum* var. *lancifolia*.

Fig. 6 = plants  $\times 1.5$ ; 7 = A portion of plant enlarged  $\times 50$ , 8 A leaf  $\times 100$ ; 9 = Laminar cells  $\times 250$ .

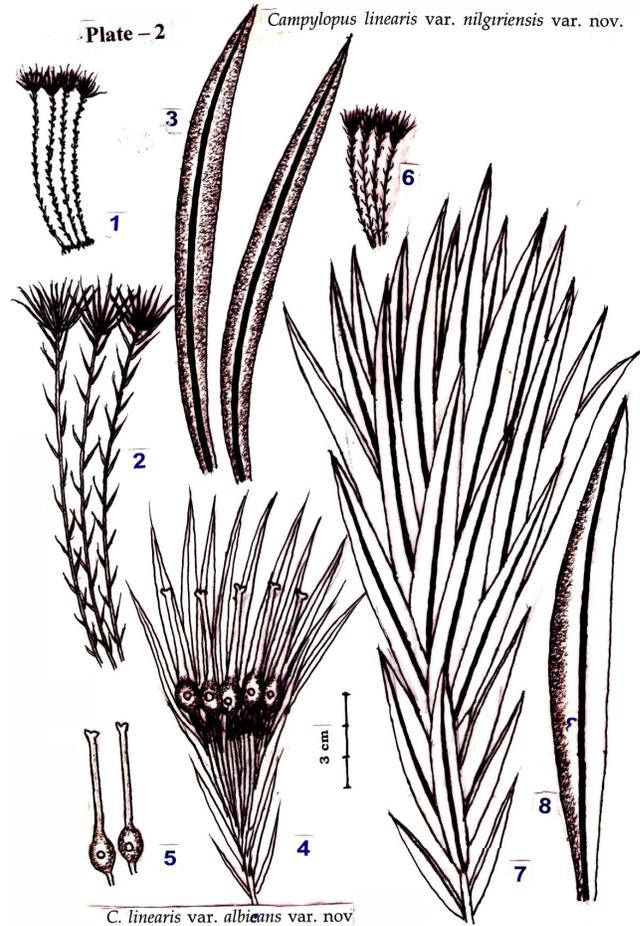
## II. Dicranaceae

### 2. *Dicranum indicum* D.S. var. *lancifolia* var. nov. (Plate 1)

A long hairy plant without branching, 3 to 4 cm. tall, tip of plant crowded with larger leaves; leaves linear lanceolate, spirally arranged; midrib thick; margin linear laminar cells rectangular; capsule not seen.

An epiphyte collected on tree trunks in thick forests near Coonoor, Nilagiri Hills.

The author has described in his book, "Mosses of Tamil Nadu" in 2008 *Dicranum dilatinerve* Card. & Varde and published a few species of this genus, namely *D. kalrayensis* D.S., *D. lancifolia* D.S., *D. ovalifolia* D.S., *D. indicum* D.S. and *D. indicum* var. *spinifolium* D.S. in *Plant Archives* in 2007.

Plate 2 : *Campylopus linearis*.

Figs. 1 to 5 var. *nilgiriensis*.

Fig. 1 plants  $\times 1$ ; 2 = plants slightly enlarged  $\times 20$ ; 3 = leaves  $\times 100$ ; 4 = plant tip with Archegonia  $\times 50$ ; 5 = Archegonia  $\times 50$ .

Figs. 6 to 8 = var. *albicans*

Fig - 8 : Plants  $\times 1$ , 7 = Tip of the plant enlarged  $\times 50$ ; 3 = A leaf  $\times 100$ .

The present plant resembles *D. indicum* in leaf shape, but different in taller size of plants, lanceolate leaves, and presence of midrib.

Holotype No. 185 dated 15.10.2015, deposited at B.S.I., CBE, T.N. and Isotype No. 2213. at author's home laboratory.

### 3. *Campylopus linearis* D.S. var. *nilgiriensis* var nov. (Plate 2)

This plant was collected under thick forests as epiphytes in Avalanche, Ooty. This plant is longer, 3 to 4 cm tall, brown when dry and the second plant 2 to 3.5 cm tall untauched, erect and white when day.

This plant has linear lanceolate and curved leaves. A few plants have enlarged tips with archegonia.

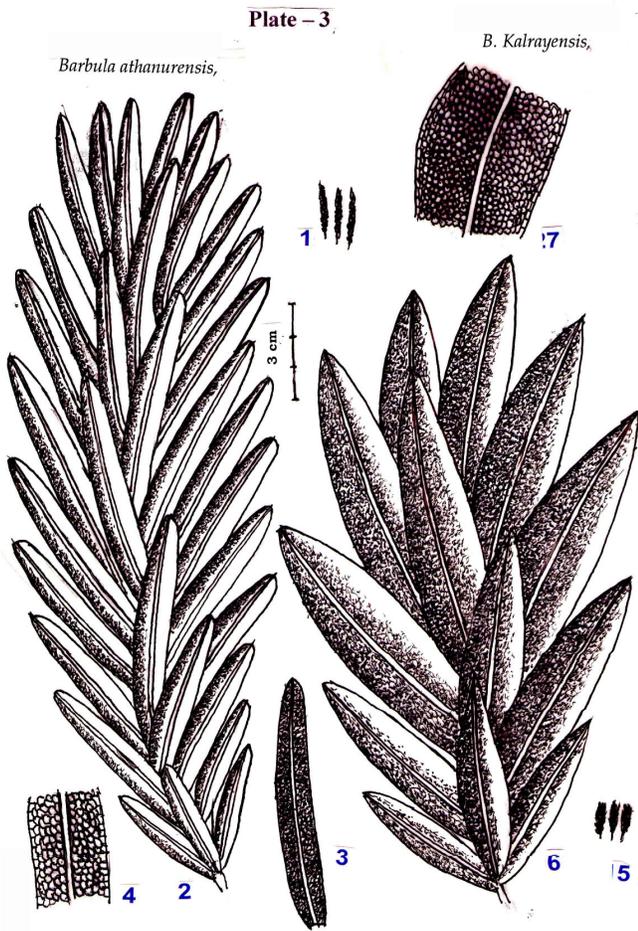


Plate - 3

*Barbula athanurensis*,

*B. Kalrayensis*,

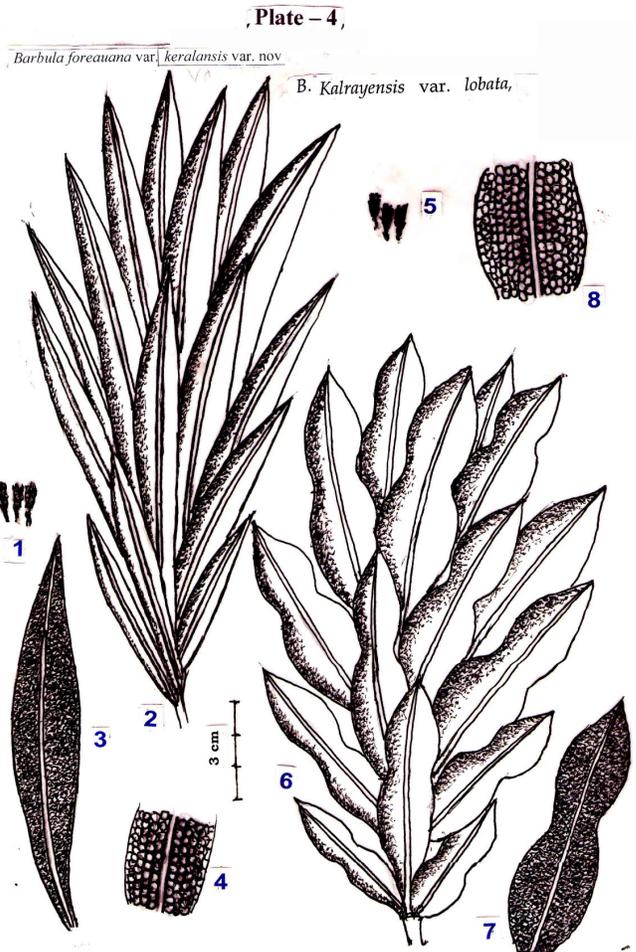


Plate - 4,

*Barbula foreauana* var. *nilgiriensis* var. nov

*B. Kalrayensis* var. *lobata*,

Plate 3

Figs. 1 to 4 = *Barbula athanurensis*.

Fig. 1 = Plants  $\times 1$ ; 2 = A plant enlarged  $\times 100$ ; 3 = A leaf  $\times 100$ ; 4 = laminar cells  $\times 250$ .

Figs. 5 to 7 = *Barbula kalrayensis*

Fig. 5 = Plants  $\times 1$ ; 6 = A plant enlarged  $\times 100$ ; 7 = Laminar cells  $\times 250$ .

Plate 4

Figs. 1 to 4 = *Barbula foreauana* var. *nilgiriensis*.

Fig. 1 = Plants  $\times 1$ ; 2 = A plant enlarged  $\times 100$ ; 3 = A leaf  $\times 120$ ; 4 = Laminar cells  $\times 250$ .

Figs. 5 to 8 = *Barbula kalrayensis* var. *lobata*.

Fig. 5 = Plants  $\times 1$ ; 6 = A plant enlarged  $\times 100$ ; 7 = A leaf  $\times 100$ ; 8 = Laminar cells  $\times 250$ .

The type plant *C. linearis* was already collected from Yercaud and described by the author (Subramanian, 2007).

Collection Nos. 1037

Holotype Nos. 186 dated 15.10.2015, deposited at B.S.I., C.B.E., T.N. and isotypes at author's home laboratory.

4. *C. linearis* D.S. var. *albicans* var. nov. (Plate - 2)

This plant was also collected at Avalanche.

This plant is short, 1.5 to 2.5 cm tall, unbranched and erect. Leaves smaller, tips enlarged with crowded leaves, narrow at the base and tip but enlarged in the middle.

Collection No. 1038; Holotype No. 187 dated 15.10.2015, deposited at B.S.I., CBE, T.N. and isotypes

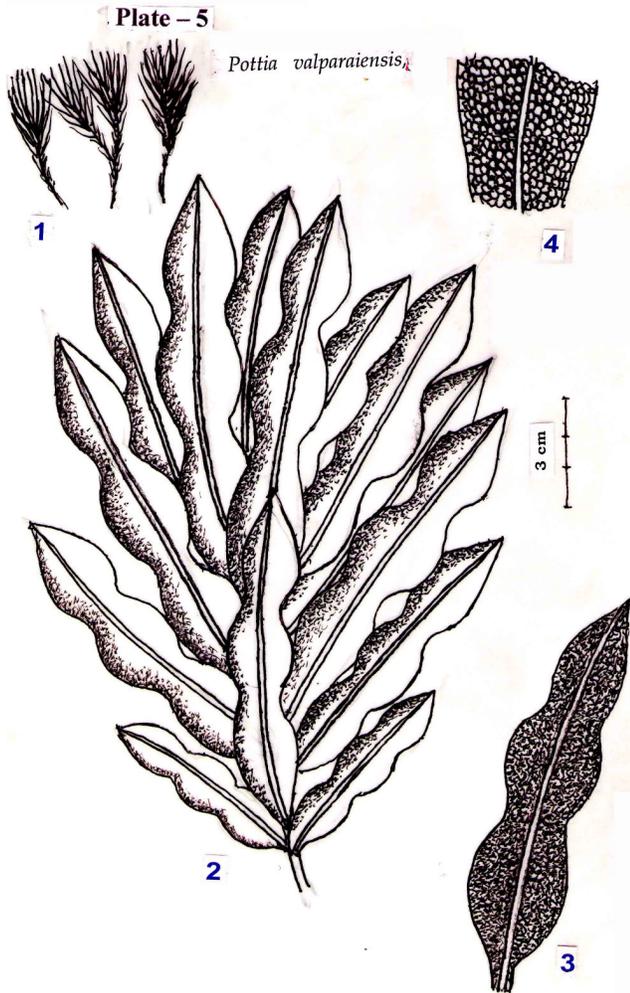
at author's home laboratory.

III. Pottiaceae

5. *Barbula athanurensis* D.S. (Plate - 3)

This plant was collected on the old brick wall in a nursery garden at Tamil Nadu Agriculture University Campus at Coimbatore, recently. A few years back this species was collected and described by the author at Ko. Athanur, Virudhachalam Taluk of Cuddalore (Subramanian, 2006).

Collection No. 1058 Isotype at author's home laboratory. Holotype No. 189. dated 15.10.2015 kept at B.S.I., CBE, T.N.



**Plate 5 :** *Pottia valparaiensis*

**Fig. 1** = Plants  $\times 1$ ; **2** = A plant enlarged  $\times 100$ ; **3** = A leaf  $\times 100$ ; **4** = Laminar cells  $\times 250$ .

**6. *Barbula kalrayensis* D.S. (Plate 3)**

This species was collected along with previous species at Combatore.

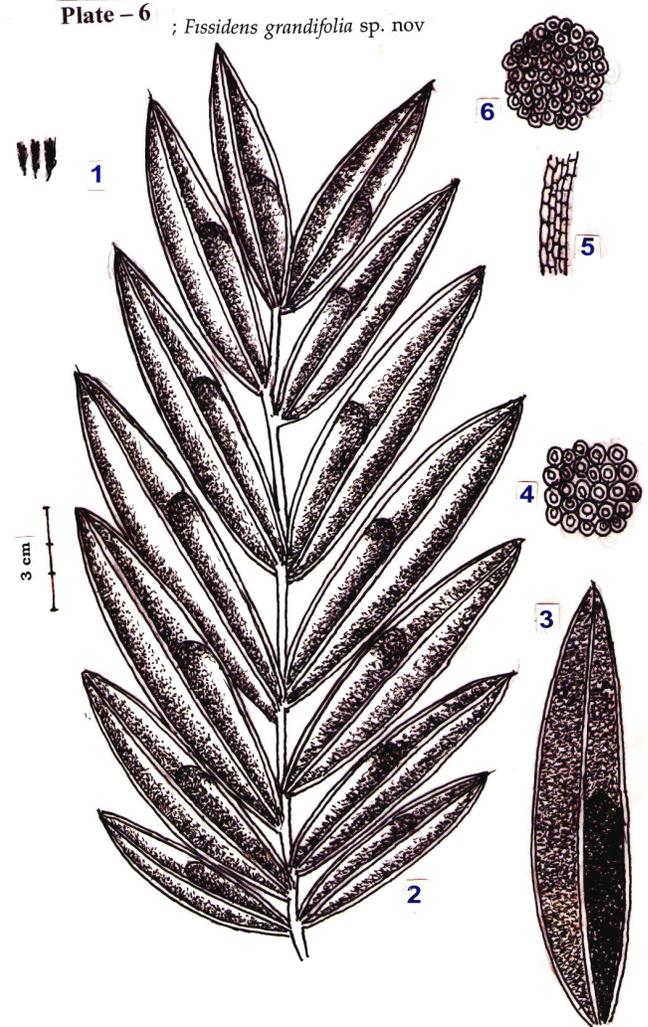
**7. *Barbula kalrayensis* D.S. var. *lobata* var. nov. (Plate 4)**

Excepting a median narrowed region separating the leaf into upper and lower lobes, all the other characters of the plant are same as in the previous plant *B. kalrayensis* D.S.

Collection No. 1061; Isotype at author's home laboratory; Holotype No. 190 dated 15.10.2015 kept at B.S.I. CBE, T.N.

**8. *Barbula foreauana* D.S. var. *nilgiriensis* var. nov. (Plate 4)**

A rare variety of *Barbula foreauana* has been



**Plate 6 :** *Fissidens grandifolia*.

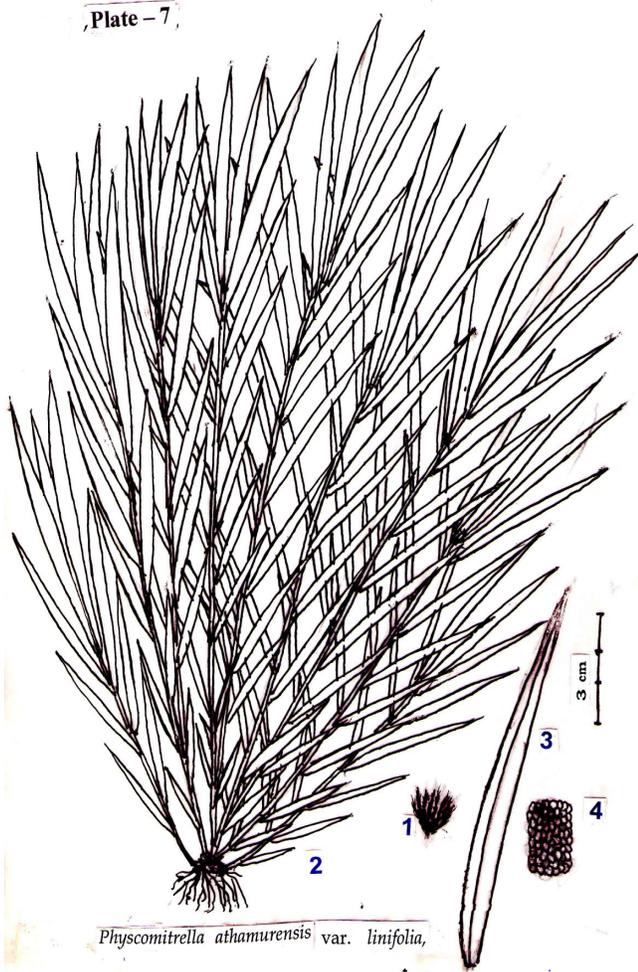
**Fig. 1** = Plants  $\times 1$ ; A plant enlarged  $\times 100$ ; **3** = A leaf  $\times 200$ ; **4** = Laminar cells  $\times 250$ ; **5** = Midrib cells  $\times 200$ ; **6** = Laminar cells  $\times 200$ .

collected from tree trunks along with some pleurocarpous Mosses in a thick forest near Thiruvananthapuram, Kerala. In this plant, the base and tip of the leaf narrow and median portion is enlarged. In all other characters, it is almost similar to the type species.

Collection No. 1050 Isotype at author's home laboratory and Holotype No. 191 dated 15.10.2015 kept at B.S.I., CBE, T.N.

**9. *Pottia valparaiensis* D.S. (Plate 5)**

This is a terrestrial Moss collected from Yercaud of Shervarayan Hills (Eastern Ghats) of Tamil Nadu recently. This plant has leaves three lobed and resembles almost to the same species already collected and described by the author from Valparai of Western Ghats (Subramanian, 2009).



*Physcomitrella athamurensis* var. *linifolia*,

**Plate 7 :** *Physcomitrella athamurensis* var. *linifolia*.  
**Fig. 1** = Plants  $\times 1$ ; **2** = plants enlarged  $\times 20$ ; **3** = A leaf  $\times 100$ ;  
**4** = Laminar cells  $\times 250$ .

Collection No. 1053 Isotype at author's home laboratory and Holotype No. 192 dated 15.10.2015 kept at B.S.I. CBE. T.N.

**IV. Bryaceae**

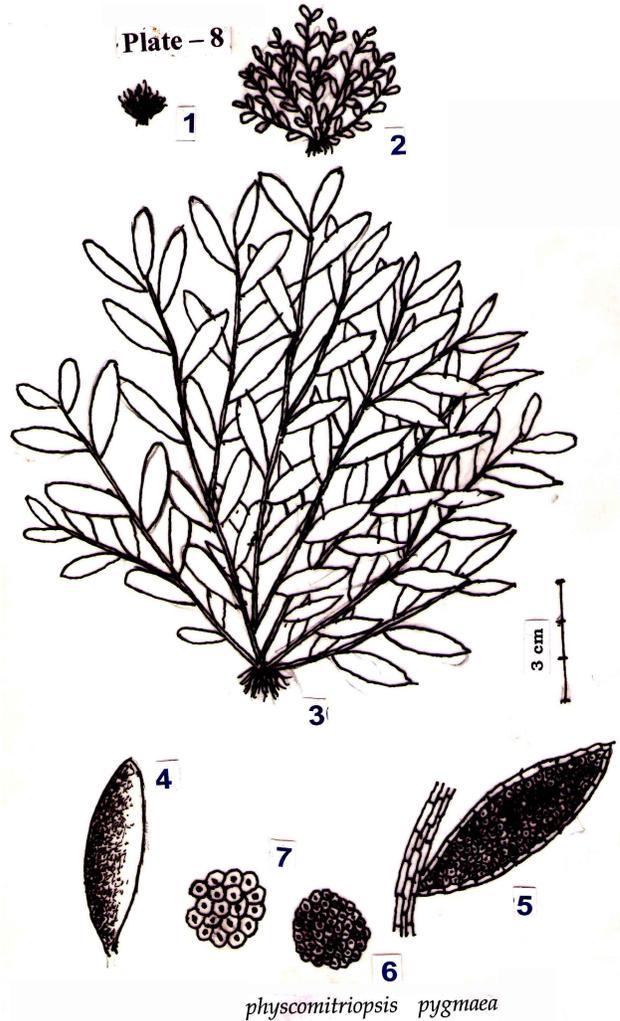
**10. Bryum ramosum (Hook) Mitt.**

This is a common Moss with a large number of species varieties and forms from the plains upto hill stations with higher elevations throughout India. There are 2 forms of this species collected on 6.8.2015 at ko Athanur, the native place of the author.

**V. Fissidentaeae**

**11. Fissidens grandifolia sp. nov. (Plate 6)**

This species was collected as epiphyte along with other Mosses in tree barks in thick forests near Coonoor, Nilagiri hills.



*physcomitriopsis pygmaea*

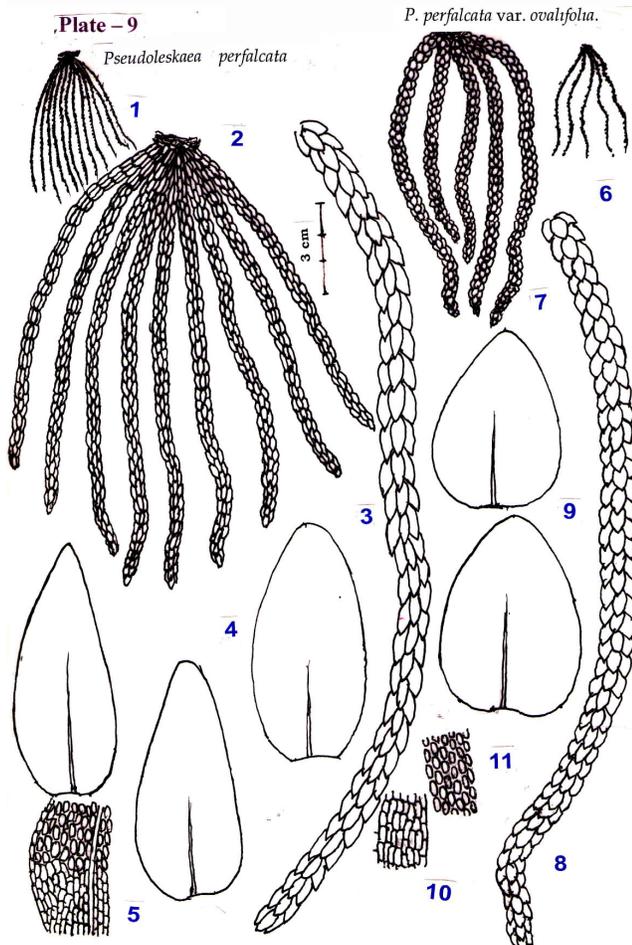
**Plate 8 :** *Physcomitriopsis pygmaea*.  
**Fig. 1** = Plants  $\times 1$ ; **2** = Plants slightly enlarged  $\times 20$ ; **3** = Plants more enlarged  $\times 100$ , **4 & 5** = leaves  $\times 200$ ; **6 & 7** = Laminar cells  $\times 200$  &  $250$ , respectively.

Plants unbranched, erect, 1.2 to 1.5 cm tall; Leaves in 2 rows, broad and long 1.50 to 1.52 mm long and 0.6 to 0.7 mm broad; 6 to 7 leaves on either side, broad midrib with thin walled cells, 2 to 4 rows, rectangular, marginal border of 2 to 4 rows of thin walled cells; vaginant lamina clear; laminar cells spherical and thick walled; capsule not seen.

This plant resembles *Fissidens undulaefolia* D.S. collected as epiphytes by the author at Naduvatta in 2010 on trees of thick forests.

Both the present plant and *F. undulaefolia* are epiphytes, larger leaved but in leaf shape, straight margin and general appearance of plants, the present plant is differing from it.

Collection No. 1048 Isotype at author's home laboratory and Holotype No. 187 dated 15.10.2015 at



**Plate 9**

**Figs. 1 to 5 = *Pseudoleskaea perfalcata* var. *ovalifolia*.**

**Fig. 1 = Plants  $\times 1.5$ ; 2 = Plants slightly enlarged  $\times 20$ ; 3 = A plant more enlarged  $\times 50$ ; 4 = Leaf variations  $\times 100$ ; 5 - Laminar cells  $\times 250$ .**

**Figs. 6 to 11 = *Pseudoleskaea perfalcata*.**

**Fig. 6 = Plants  $\times 1.5$ ; 7 = Plant slightly enlarged  $\times 20$ ; 8 = A plant more enlarged  $\times 50$ ; 9 = Leaf variations  $\times 100$ ; 10 = Basal leaf cells  $\times 250$ ; 11 = Upper leaf cells  $\times 250$ .**

B.S.I. CBE, T.N.

## 12. *Fissidens barbuloides* D.S.

This species was also collected along with previous plant, as epiphyte. The same species was already collected and described by the author at Guruvayur, Kerala (Subramanian, 2011).

## VI. Funariaceae

### 13. *Physcomitrella athanurensis* D.S. var. *linifolia* var. non. (Plate 7)

This is a peculiar epiphyte collected along with other pleurocarpous mosses near thick forests of Thiruvananthapuram, Kerala. Leaves linear lanceolate

arranged spirally; plants thin and hairy arising from the same point in cluster, unbranched; laminar cells circular, midrib percurrent, margin linear capsule not seen.

Collection No. 1015; Isotype at author's home laboratory and Holotype No. 193 dated 15.10.2015 kept at B.S.I. CBE, T.N.

### 14. *Physcomitriopsis pygmaea* sp. nov. (Plate 8)

This species was also rarely collected in the same place like previous plant. The plants resemble *Gymnostomiella indica* in leaf character but the present plant arises as a colony with many branches and leaf cells resemble to those of *Physcomitriopsis* species already published by the author (Subramanian, 2009) from Valparai of Tamil Nadu, India.

Leaf elongated egg shaped, narrow at the base and tip but enlarged in the middle, no midrib, margin linear, plant 0.6. to 0.8 cm tall; capsule not seen.

Collection No. 1065, Isotype at authors home laboratory and Holotype No. 194 dated 15.10.2015 at B.S.I. CBE, T.N.

## VII. Leskeaceae

This is one of the pleurocarpous families of Mosses (Plate 9).

Rev. Fr. Foreau (1961) has enumerated this species in a paper, the reprint of which the author could get unexpectedly in a dust pin in Botany Department, Annamalai University, when he was working as a staff in this Department. After a few years, the author could get 2 large bundles of Mosses collected by Rev. Fr. Foreau in 1920 to 1945 from the Botany Department, at the time when it was to be thrown away as waste and unnecessary materials in the office of the Head of the Department, just 4 or 5 months before the retirement of the author in 2002. In one of the packets of a bundle this plant, very interesting to look at, was obtained. Even this was not labeled but the author could draw the plants and plant parts of this plant. Even this plant was not included in author's "Mosses of Tamil Nadu" published in 2008. After this the author could see the very beautiful plants of *Pseudoleskaea imbricata* S.A. drawn in page 408 of the book. "The Mosses of Southern Australia" by Scott and Stone (1976). This has enabled the author to identify the plant *Pseudoleskaea perfalcata* collected by Dixon and Varde (1920 to 1930) and enumerated by Rev. Fr. Foreau (1961). Therefore, diagrams are important in Mosses as they are highly homogeneous plants. Even at international Herbarium Center at England or any other place, we could not get so easily the identification help of a Moss plant. This is the more important reason why the

floristic studies on Mosses have not been taken throughout India in a large scale.

*Pseudoleskaea perfalcata* and its variety, *ovalifolia* var. nov. are more interesting plants of Leskaceae. The plants appear as “Sadai of women” (in Tamil).

The new variety, *P. perfalcata* Dix & Varde var. *ovalifolia* is the second plant described for the first time from Tamil Nadu. It was collected at Kollimalai Hills of Eastern Ghats as epiphytes on tree trunks. The plants in cluster, tread like, unbranched; Leaves oval, spirally arranged; no capsule; Holotype no. 195 dated 15.10.2015 at B.S.I. CBE., T.N. Isotype at author’s home laboratory.

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