

# Studies on a rare Indian liverwort : *Schiffneria hyalina* Steph.

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*Schiffneria hyalina* Steph. collected from Sandakphu, Darjeeling (eastern Himalaya), has been studied in detail. It is characterized by a dorsiventrally flattened and laterally lobed thallus bearing well developed leafy sexual branches on ventral side or rarely at apex, oblong perianth (3/4th of female shoot) with dentate mouth, pseudoreticulate spores and bispirally thickened elaters. The status and systematic position of the genus are discussed. SEM details of spores and elaters are provided for the first time.

**Key-words**—Morphotaxonomy, Hepaticae, Cephaloziaceae, *Schiffneria hyalina* Steph

## INTRODUCTION

THE genus *Schiffneria* Steph. was instituted by Stephani (1894) from Batjan (Indonesia). Its type species is *S. hyalina* Steph. Due to the presence of a remarkable combination of thallose and foliose habit the genus had been a subject of debate from the phylogenetic point of view. The vegetative plant is thalloid whereas the male and female sex organs are borne on well developed leafy shoots present on ventral surface or rarely at apex of dorsiventrally flattened thallus.

Evans (1939) and Müller (1951-58) placed *Schiffneria* with *Zoopsis*, *Pteropsiella* and *Protocephalozia* in the Cephaloziaceae. However, Schuster (1966) did not agree with the above placement because these three genera exhibit the development of a flat thallus although in all of them vestiges of the leaf may be seen. However, *Schiffneria* is most robust and appears to be quite comparable to *Cephalozia* in which the axis has become flattened and leaves reduced to flat lateral ear-like lobes (Buch, 1930) and only sexual branches possess normal leaves. In view of the above characteristics, *Schiffneria* has been placed in the sub-family Schiffnerioideae (closely allied to Cephalozioideae) by Schuster (1974).

Goebel (1893) has shown that certain thallose genera among the Jungermanniales, e.g. *Pteropsiella* seems to be clearly derived from leafy ancestors, but he was reluc-

tant to conclude that all thallose hepaticae had descended from leafy ancestors. Evans (1939) suggested that evolution from leafy to thalloid form has taken place by flattening of axis and by a gradual decrease in size of leaves, which have ultimately reduced to vestigial marginal papillae. Genera like *Schiffneria* and *Zoopsis* in which more or less reduced leaves are associated with flattened axes, represent intermediate conditions and in both the sexual branches retain the features of typical leafy shoot.

Some species of *Calypogeia* and *Cephalozia* remarkably exhibit the dorsiventral flattening of the axis and an advance degree over *Schiffneria* in which the axis is extremely flattened and the leaves are reduced to entire lobes, present laterally on the flattened axis. Only the sexual branches growing ventrally or at apex retain the leaves.

The genus *Schiffneria* was earlier represented by 3 species in the world, viz., *S. hyalina* Steph., *S. viridis* Steph. and *S. levieri* Schiffn. ex Goebel. *S. hyalina* and *S. viridis* were instituted by Stephani (1894, 1908) from Batjan Island, Indonesia and Japan (Mt. Koya) respectively whereas, *S. levieri* was established by Goebel (1928) from Kurseong. Pande (1958) and Parihar (1961-62) mentioned in their publications, the occurrence of *S. levieri* in eastern Himalaya (India). Hattori (1954) treated *S. viridis* as synonym of *S. hyalina* and similarly Inoue (1974) also placed the former species as synonym under the latter

which has been generally accepted. Subsequently, Kitagawa (1973) reduced *S. levieri* as synonym of *S. hyalina*. As a result *Schiffneria* is now globally represented by only one genuine species, i.e., *S. hyalina* Steph. This monotypic genus is endemic to Asia (Grolle & Pippo, 1984; Pippo, 1990) to the best of our knowledge. During an investigation of a collection from eastern Himalaya, plants of *S. hyalina* have been encountered from Sandakphu-Tanglu (Darjeeling). A detailed illustrated morpho-taxonomical account of the above genus has been provided in this paper.

## DESCRIPTION

*Schiffneria hyalina* Steph.

Pl. 1, figs 1-6; Pl. 2, figs 1-2; Text-figs 1-17

*Schiffneria hyalina* Steph. Oest. bot. Zeitchr 44:1 (1894)

Synonyms : *Schiffneria viridis*\* Steph., Spec. Hep. 3: 278 (1908).  
*Schiffneria levieri*\*\* Schiffn. ex Geobel. Ann. Jard. Bot. Buetenzorg 39: 89 (1928)

Plants dorsiventrally flattened, thalloid, 17mm x 3 mm, thallus deeply dissected at regular intervals on both of its lateral sides forming lobes, in a cross section thallus upto 7 cells thick at midrib and uniseriate at lobed wings. Androecia leafy, usually on ventral branches, rarely terminal in position, 1.5-2 mm long; antheridial body 240 µm in diameter with biseriate stalk occurring singly in the axil of saccate bracts. Gynoecial branches leafy, up to 5 mm long, ventral (rarely terminal) in position, characterized by a well developed leafy shoot, usually with 2-5 pairs of leaf-lobe; leaf-lobes 1-1.25 mm x 0.85-1.12 mm in size; cells thin walled, 80-100 µm x 50-70 µm; underleaves 2 or more, 0.35 x 0.28 mm, usually bilobed; perianth terminal on female leafy shoot with 1 pair of bract and 1 bracteole, bracts characteristically longer, bilobed, 1.5 mm as long as wide, lobe apices acute or obtuse with marginal tooth, 1-3 cell high, occasionally with hyaline papilla; bracteole bilobed, sometimes longer than broad, 0.73-1.5 mm x 0.5 mm, sometimes with marginal tooth. Perianth terminal, oblong, smooth walled, usually 3 mm long and 1 mm wide, mouth dented having small folds confined to apex, mouth-dentitions 1-5 cells high, perianth cells elongated, 80-100 µm x 30-40 µm, thin walled. Sporophyte consists of ovoid capsule, long seta; capsule wall bistratose, outer epidermal layer

with nodulose, slightly elongated (confluent) thickenings on each alternate longitudinal wall, inner lining layer of capsule with faint thickening bands on transverse wall in continuation with prominent nodules on radial walls. Spores light yellowish brown, 12.5-15 µm in diameter under SEM sporoderm exhibited pseudoreticulate pattern formed due to coalition of thick verrucae with thick triradiate mark on proximal face. Elaters numerous, 140-280 µm long, yellowish brown, bispirally thickened with rounded ends.

*Specimens examined*—*Schiffneria hyalina*. India, eastern Himalaya, Darjeeling (Sandakphu-Tanglu 27.05° N, 88° E, alt. ca. 4000 m), 26 April, 1965, Leg. S. Chandra, LWG 202450/Bry., growing on decayed logs in association with *Plagiochila* sp. and mosses; Japan. Pref. Kumamoto: Mt. Ichifusa on decayed logs beneath forest, 8 Aug., 1954, Leg.: T. Sugino, Det.: S. Hattori, Hn 53672; Pref. Shiga: Int. Hiei-zan (600 m), on log. 20 June, 1954, Leg. et Det.: T. Kodama, Hn 64018; Udawan Loey: eastern slope of Mt. Phu Luang (ca. 1300 m alt.), on rock in moist evergreen forest, 6 Dec. 1965, Leg.: M. Tagawa & N. Kitagawa, Hepaticae Asia - 277609 (Flora of Thailand); Taiwan: Mt. Peitsatienshan, On fallen decaying log, 14 April, 1972, Leg. et Det.: Mung-Jou Lai, Hepaticae Asia, Hepaticae Fomosa (No. 5667) 350966; Chiaya Co.: Mt. Alishan, Tzechung (ca. 2300 m. alt.), 10 April, 1978, Leg. et Det.: M.J. Lai, Hepaticae Asia-390398 (Herb. Botany Deptt. National Taiwan University, Taiwan, Republic of China, No. 10175); Mt. Sago near Pajakumbor (alt. 2000 m.) summit region, Mt. Sago, 29 June, 1956, Leg. W. Meijer, Hepaticae Asia-Hattori Bot. Lab. 406008.

*Schiffneria viridis*. Japan. Kyushu: Miyazaki pref., Kitamurokatagun, nakagomura, Obirano, Nakaka-wachi (ca. 550 m, alt.), 23 Oct. 1945, Leg. S. Hattori, 10716; Prov. Higo: Kuma, mt. O'hira (700 m) on decayed wood, 3 Nov. 1949, Leg. K. Mayebara, 5643; Hitoyoshi (750 m) on rotten logs, 1 April, 1950, Leg.: K. Mayebara, 6405.

*Range of Distribution* - India, Darjeeling, Sandakphu-Tanglu (ca. 4000 m), Kurseong (ca. 2450 m); Indonesia; Nollucas (Batjan Islands); North Borneo; Malaysia (Cameron Highlands, ca. 1600 m); Sumatra (Brastagi); Thailand (1300-1700 m); China; Taiwan (2300-2800 m); Japan northwards till Honshu); Papua New Guinea.

Synonyms based on \*Hatton (1954) and \*\*Kitagaura (1973)

## Plate 1

*Schiffneria hyalina* Steph.

1. Male leafy shoot arising from apex and ventral surface of thallus (x 25).
2. Male leafy shoots on ventral surface (x 25).

3. Female shoot with perianth and sporophyte (x 23).
4. Female bract (x 53).
5. Under leaf (x 114).
6. Female bracteole (x 45).

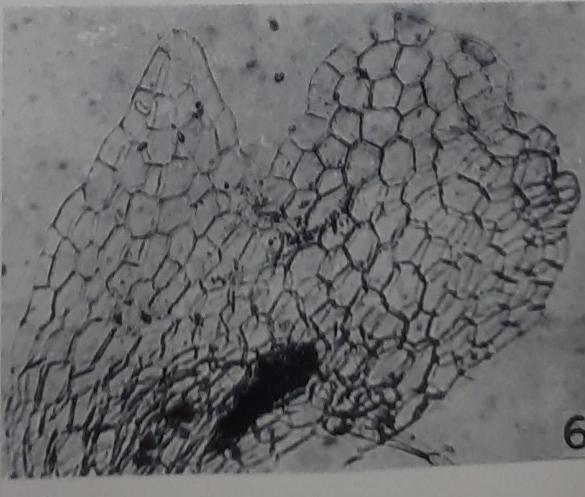
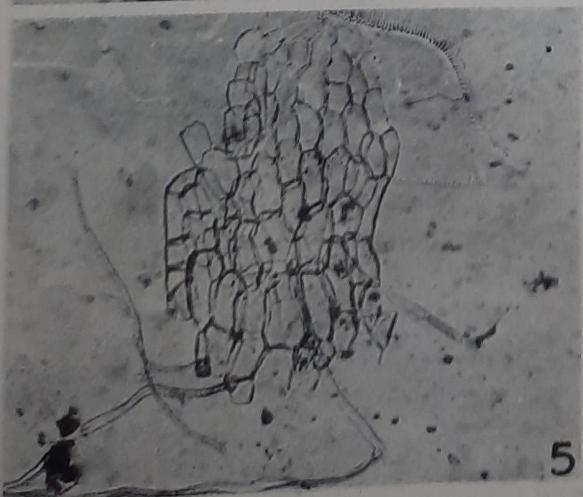
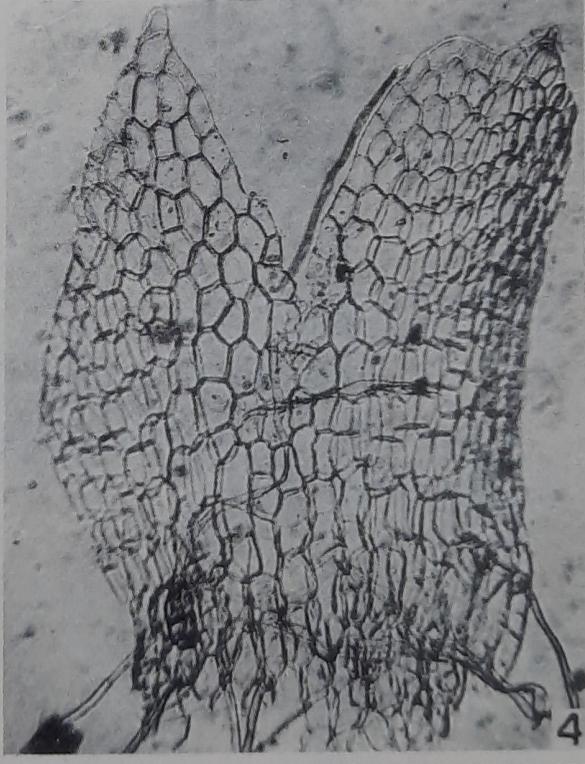
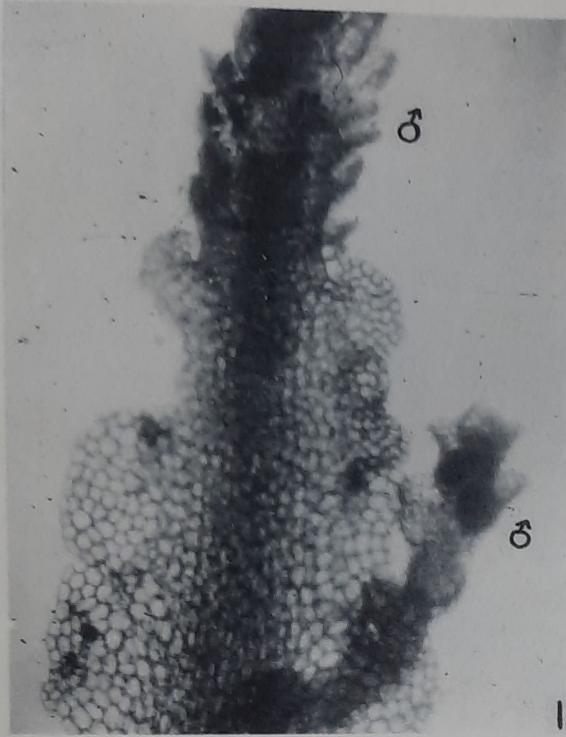
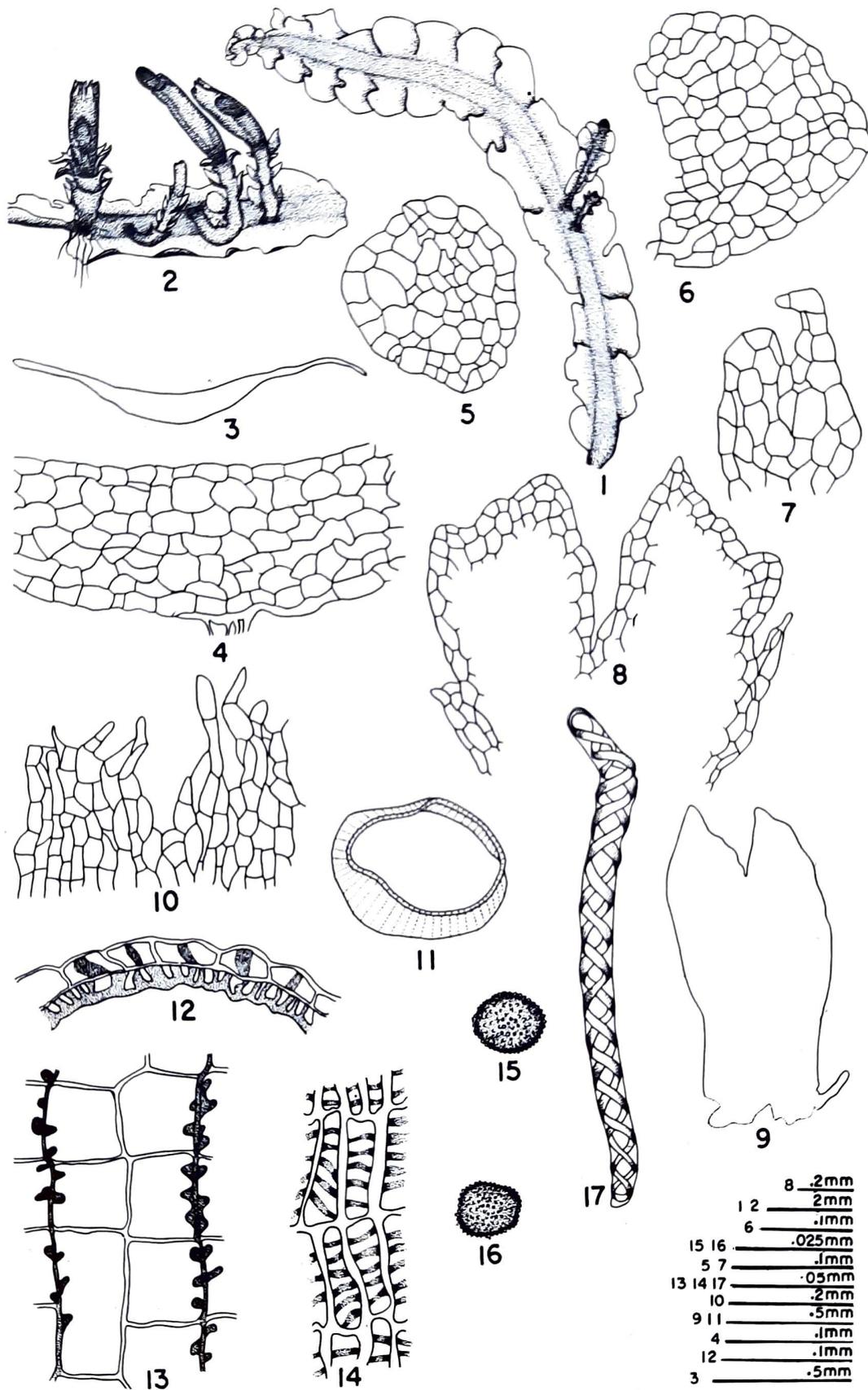
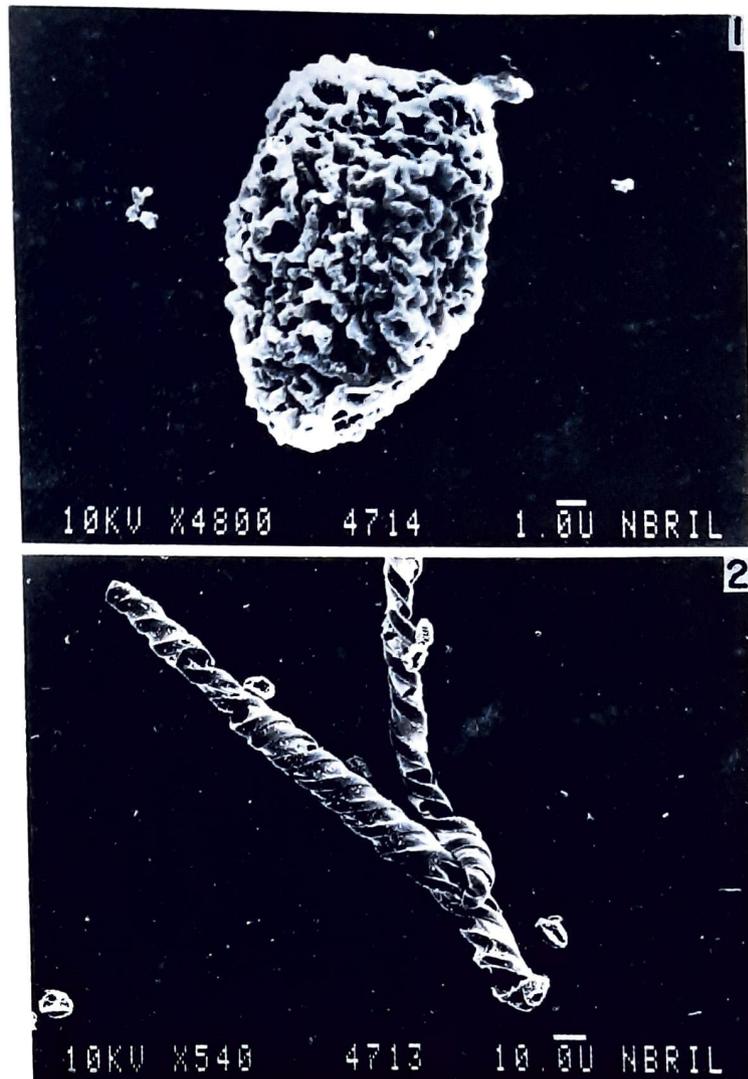


Plate 1



**Text-figures 1-17.** *Schiffneria hyalina* Steph-1, Dorsiventrally flattened thallus with lateral lobes; 2, Thallus having female leafy shoots on ventral surface; 3, 4, Cross section of thallus; 5, Cross section of stem of female leafy shoot. 6; Leaf lobe from female leafy branch; 7, Underleaf; 8, Female bract with marginal tooth and hyaline papilla; 9, Female bracteole; 10, Perianth mouth (a portion); 11, Cross section of perianth; 12, Transverse section of capsule wall; 13, Outer layer of capsule wall; 14, Inner layer of capsule wall; 15, 16, Spores; 17, Elater showing bispiral thickening bands.



### Plate 2

*Schiffneria hyalina* Steph.

- 1, Spore showing irregular verrucae forming pseudoreticulate pattern;

- 2, Bispiral elater with some spores.

### DISCUSSION

A critical and comparative study of Indian plants with authentic specimens of *Schiffneria hyalina* has clearly revealed that they belong to *S. hyalina*. Besides, authentic (Japanese) specimens of *S. hyalina* have also been investigated and found closely allied to *S. hyalina*. However, slight variation in size of plants, leaf lobes, underleaves and bracteoles of female shoot of Indian and Japanese specimens have been noticed which may be due to the ecological factors. The Japanese specimens of *S. hyalina* and *S. viridis* clearly exhibit a close alliance with

those of Indian in the size of dorsiventrally flattened vegetative thallus (upto 2.5 cm long in *S. hyalina*, 1-2 cm long in *S. viridis*), length of female leafy shoot (4-5 mm in *S. hyalina*, 5 mm in *S. viridis*), oblong perianth (3.5 mm long in *S. hyalina*, 3-8 mm in *S. viridis*), leaf-lobes of female shoot (1 x 0.5 mm in *S. hyalina*, 0.75-1 x 0.5 mm in *S. viridis*), cell size (80-90 x 50-60  $\mu$ m in *S. hyalina* and same in *S. viridis*), bracts (1 x 1.5 mm in *S. hyalina*, 1.12-1.25 x 0.75-1 mm in *S. viridis*) and bracteoles (1.1 x 0.85 mm in *S. hyalina*, 1 x 0.5 mm in *S. viridis*).

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