

## STUDIES ON TAIWAN MOSSES.

### Notes on Three Noteworthy Mosses of Taiwan

by

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The mosses treated in this paper include three noteworthy species namely, *Polytrichum commune* Hedw., *Polytrichum urnigerum* Hedw., and *Fissidens grandifrons* Brid. The specimen *Polytrichum commune* Hedw. (1146) which was growing submerged in a duck pond was sent to me by Dr. Charles DeVol, collected January 15, 1961, by Mr. T. H. Chow from Mount Seven-star, *Polytrichum urnigerum* Hedw. (1145) and *Fissidens grandifrons* Brid. (1142) were collected February 28, 1955, by Mr. M. T. Kao from Mount Nun-Kao, altitude 2800 m., submerged in ice water on the snow-covered ground.

In spite of their aquatic habit, either submerged or embedded partially in water of alpine altitude, the mosses above do not belong to the true water moss family, the Fontinalaceae. After a careful study of each specimen, the writer came to conclude that they are first records for Taiwan.

I. *Polytrichum commune* Hedw. (Pl. I, Figs. 1-4) is distinguished from other species of the Genus by its gigantic form reaching a height of almost one foot or more, the tallest moss ever collected from Taiwan. Because of its submerged habit and its flexible appearance, it was, at first, mistaken as one of the Fontinalis. But careful microscopic study of the leaf and stem immediately revealed the characters of *Polytrichum commune* Hedw.<sup>(1)</sup> The lanceolate leaves measured 8-12 mm. long, with strong costa and glossy sheathing bases and toothed margins, are drawn into sharp pointed tips. A cross section of the leaf blade disclosed the conspicuous lamellae occupy almost the entire width of the leaf (Pl. I, Fig. 3); each lamella has a vertical row of 4-6 square basal cells and one notched terminal cell at the top (Pl. I, Fig. 4). A transverse section of the stem showed an irregular, 5-cornered outline containing a small group of large thin-walled cells in the center surrounded by several layers of smaller, thick-walled cells which were again encircled by a wide zone of large cortical cells and a few more layers of compact cells on the outermost region (Pl. I, Fig. 2). Fruit is lacking, or if present, it is a 4-sided box when ripe, its length usually a little greater than its width.

*Polytrichum commune* Hedw. is a tall, conspicuous moss of acid bogs and ponds, distributed widely in Europe, North America, Japan and elsewhere in the world, but it is strange to note that no previous record is found in Taiwan. Horikawa<sup>(2)</sup> reported

(1) Watson, E. V., 1955. *British Mosses and Liverworts*, P. 119. Cambridge at the University Press.

(2) Horikawa, Y., 1939. *Asabina's Nippon Inkwasoyokubutusu Duken*, 989-991.

in 1939 the occurrence of *Polytrichum commune* L. in Manchuria, Japan, Taiwan and Korea. In comparing Horikawa's description and Braithwaite's figures<sup>(3)</sup> on *Polytrichum commune* L. with the present material, I found that there are slight differences in the structure of these two plants. First, the terminal lamella cells of *Polytrichum commune* L. are more deeply notched in a saddle fashion, while those in the present specimen, *P. commune* Hedw. are more or less, broadly or gradually notched. Moreover, the stem cross section of the former is a definite triangular outline, while in the latter, it is an irregular, 5-cornered outline. In going over the herbarium specimens deposited in Botany Department, National Taiwan University, the writer came across a small packet containing scanty specimens of *Polytrichum commune* L., collected on June 23, 1940, by Tadao Kimpyo and coincidentally from a similar habitat (duck pond, Mt. Seven-star). Externally, it showed no marked difference whatever from *Polytrichum commune* Hedw., but a stem section immediately proved that the former has the same anatomical attributes of the latter, that is, a five-cornered outline instead of triangular. Evidently, the herbarium specimen, although labelled as *Polytrichum commune* L. is *P. commune* Hedw. like the present specimen but not *P. commune* L. with a triangular stem as described in Braithwaite. Hence, the present specimen, *Polytrichum commune* Hedw. is the first record for Taiwan.

Habitat: Submerged in duck pond

Taiwan distribution: Mt. Seven-star, Taipei, Taiwan. Found twice in the same locality.

II. *Polytrichum urnigerum* Hedw. (Pl. I, Figs. 5-6) is reddish brown in dry specimen, robust and strong in character. Stem varies from 6-8 cm. high; leaves lanceolate possessing the usual polytrichum characters of a broad sheathing base, longitudinal rows of lamellae on its broad mid-rib. Each lamella has 4 basal cells and one terminal cell which is enlarged and covered with papillae (Pl. I, Fig. 6)<sup>(4)</sup>.

*Polytrichum urnigerum* Hedw. is restricted to hilly and mountainous districts, growing on acid soil at the edges of screes. *Grimmia* and *Hedwigia albans* were occasionally mixed in the collection. It explains the fact that *P. urnigerum* can inhabit in the exposed alpine districts where *Grimmia* and *Hedwigia* usually occur. It is also the first record for Taiwan.

Habitat: In ice water, snowground, alpine regions.

Taiwan distribution: Mount Nun-Kao, Hwa-lien; Mt. Ali, Chai-yi

III. *Fissidens grandifrons* Brid. (Pl. II, Figs. 1-2) is one of the *Pachyissidens* characterized by thick, hard leaves of multilayered cells. Other species of the group described briefly in Engler and Prantl<sup>(5)</sup> were namely: *F. subgrandifrons* C. Mull. in Tibet; *F. perdecurrens* Besch. and *F. planicaulis* Besch. in Japan; and *F. Yunnanensis* Besch. in China. Collectively, these species are very closely related to *F. grandifrons*.

(3) Braithwaite, R., 1887. The British Moss-Flora, Vol. I, 57, T. IX.

(4) Watson, E. V., 1955. British Mosses & Liverworts, 114-115.

(5) Engler and Prantl, 1909. Die Natürlichen Pflanzenfamilien, 361,



Brid. It was reported to be found on calcareous rock under water in Switzerland, in Franc, ein Pyresaen, in Algeria, N. W. Himalaya and Nordamerika; but no record was found for the Eastern Asia. Probably it is not only the first record for Taiwan, but also Eastern Asia including Philippine, Japan and Korea.

*Fissidens grandifrons* Brid. is dark brown in color when dry, grown attached closely to rocks, each about 2-3cm. long, with two ranked thick, stiff leaves. A median section of the leaf appeared to be saddle-shaped, multilayered in the costa region and gradually narrowing to one-cell thick on the edges. Large parenchymatous cells are clearly shown in Pl. II, Fig. 3. The stem has no distinct central strand but a mass of parenchymatous cells fills the entire inner stem. (Pl. II. Fig. 4, 5).

*Fissidens grandifrons* Brid. is an uncommon moss of high altitude in cool regions. Its occurrence in Taiwan indicates an extension of its distribution which was formerly known only in N. Europe and Western Asia among the Himalaya and Tibet mountains, to Eastern Asia as far as Taiwan in the mountains of subtropical regions.

Habitat: Submerged in ice water, snowground alt. 2800 m. or on steepy calcareous cliff under flushing water, alt. 1900 m.

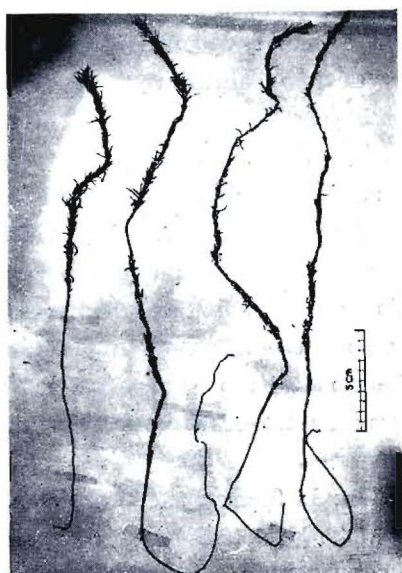
Taiwan distribution: Mt. Nun-Kao, Hwa-lien; Li Shan, Tai-chung Hsien.

(Specimens from Nun-kao collected by M. T. Kao, 1955, have thick, stiff leaves closely arranged and appressed to calcareous rocks while those from Li Shan, collected by Misses W.C. Li and T.Y. Wang, October 29, 1962, have thinner leaves, more or less loosely arranged, taller and softer than the former, about 3-5 cm. in length.)

The foregoing mosses are restricted to high altitudes and favor in wet or aquatic habitats. *Polytrichum commune* Hedw. is characterised by its gigantic size and notched terminal cells on the lamellae; *P. urnigerum*, by its robust general feature and papillose enlarged terminal cells on the lamellae; and finally, the thick-multilayered, leaf structure of *Fissidens grandifrons* is not found in any other mosses so far studied.

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- (5) HORIKAWA, Y. 1939. Asahina's Nippon Inkwas yokubutusu Dukan. 989-991.
- (6) ———. 1950. Iconography of Japanese Bryophytes. Journal of Hikobia, Hiroshima Bot. Club. Vol. I, 1, 5, 46-47.
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- (8) WATSON, E. V. 1955. British Mosses and Liverworts. 114-115. 119.



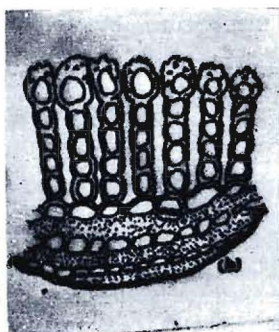
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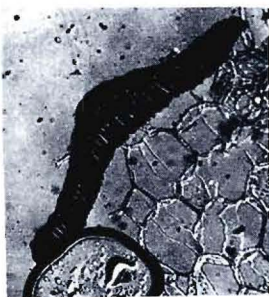
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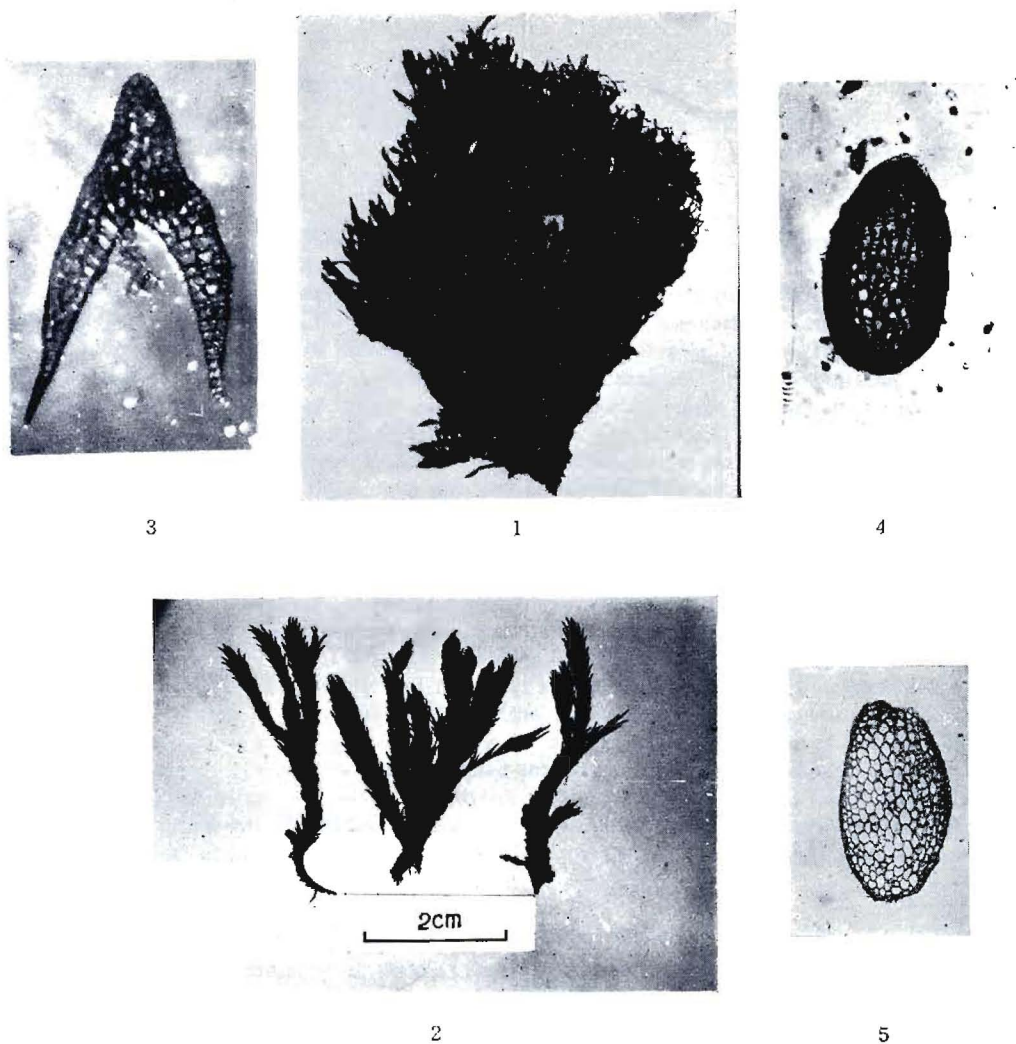
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### Plate I.

Figs. 1-4. *Polytrichum commune* Hedw. 1. Habit. 2. Stem, cross section  $\times 600$ . 3. Median c.s. of leaf  $\times 250$ . 4. Lamellae and terminal notched cells  $\times 600$ . 5-6. *Polytrichum urnigerum* Hedw. 5. Habit. 6. Lamellae and terminal papillose cells  $\times 600$ .



**Plate II.**

Figs. 1-5. *Fissidens grandifrons* Brid. 1. A patch of plants attached to calcareous rock  $\times 1/3$ . 2. Individual plants about natural size. 4, 5. Stem, cross section  $\times 250$ . 3. Leaf cross section  $\times 750$ .