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昭和 29 年 7 月

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MUSCI JAPONICI. IV

The genus *Ptychomitrium*

By Akira NOGUCHI

野口 彰：日本の蘚類（四）チヂレゴケ属

Introduction

In 1859 W. S. Sullivant and L. Lesquereux described a species of this genus, *Pt. wilsoni*, basing on a collection made by Ch. Wright. This seems to be the first record of *Ptychomitrium* from Japan. The species *Pt. brevidens* erected by V. F. Brotherus in 1899 was referred to the present species by H. Reimers. Following Sullivant's publication, in 1865 W. Mitten published two new species of *Ptychomitrium* as *Glyphomitrium dentatum* and *G. sinense* from China and Japan respectively. Concerning the Japanese materials, the former was based on the specimen from Nagasaki, Kyūsyū, while the latter on Oldham's collection without definite station. Afterwards, *G. angustifolium*, a species referred to *Pt. sinense*, was newly described by Sh. Okamura. About thirty years later, E. Bescherelle reported *Pt. fauriei* as a new species from Japan, and added each new station for *Pt. sinense*, *dentatum*, and *wilsoni*. In 1931 a common species of *Ptychomitrium*, which has been confused with *Pt. wilsoni* for a long time, was named to be *Pt. linearifolium* by Reimers. At the same time Reimers and K. Sakurai published another new species *Pt. longisetum* from Titibu, a calcareous district in central Japan. Afterwards, a new species *Pt. yakushimense* from Isl. Yakushima was proposed also by Sakurai. A few years later, in 1939, Sakurai enumerated twelve species and two varieties in his revision of Japanese *Ptychomitrium*, adding two new species, *Pt. kiusiuense* and *brevisetum* Dixon, and newly recorded species, *Pt. polyphyloides*, from Japan and a new variety. But, soon after the revision, *Pt. viride* and *rhacomitrioides* were added as new species by the same author. Unfortunately, as stated below, these five species: *yakushimense*, *kiusiuense*, *brevisetum*, *viride* and *rhacomitrioides* are synonymous with the earlier species. In the present article, seven species of *Ptychomitrium* are recognized in Japan.

The writer's acknowledgment is due to Dr. S. Hattori and Messrs. N. Takaki, K. Maebara, T. Nakazima, I. Nagano and K. Yamamoto who forwarded him many specimens of the genus.

Morphological notes

Stem—In the species of the genus, at least in Japanese members, several young gametophytes arise from a single protonema. Thus the stems grow in aggregate manner, as is the case with *Orthotrichum* and *Ulota*. After the formation of female inflorescence at the tip of stem, one or several innovations are formed beneath the vaginule. In the former case the stem has no branch, in the latter, however, the stem is usually provided with several fasciculate branches.

The stem is round in cross section and consists of three parts: the cortical

layer, intermediate medullary cells and a central strand. The cortical layer is composed of several rows of small cells, their walls are thick but with no pits, thus the cell cavities are small. Concerning the cortical layer there are found several differences between those species occurring in dry or wet stations. The intermediate medullary layer is composed of large and thin-walled cells. The cells of central strand are exceedingly small, with thin and flexuous walls in cross section. The size of the central strand varies in different species.

Leaves—Among the species of *Ptychomitrium* two distinct types of leaves are represented. The first is shown by *Pt. dentatum*, *linearifolium*, *wilsoni*, etc., the second by *Pt. sinense*, *nigricans*, *drummondii* and their allies. In the first type the upper part of leaf margins is marked by large teeth comprising several cells, not in a row, in the second the leaves are entire. In certain species, for example in *Pt. fauriei*, the stem leaves are totally entire, but the uppermost leaves of stem or perichaetal leaves frequently possess few and small teeth comprising usually one to three cells in the upper regions.

The costa being prominent in the dorsal side of leaf is stout and reaches leaf apex or nearly so. In cross section it provides both ventral and dorsal bands of stereid between the "Deuter" and the epidermal bands. The cells of epidermal bands, especially those of ventral side, are hardly differentiated from those of lamina. The areolation of leaves is essentially alike among the species of the genus. The cells are small and quadrate with rather uniformly thickened walls. In the lower region of leaves the areolation is unistratose, but in the upper region there are located several longitudinal bistratose bands in ordinary unistratose areolation. The leaf margins are definitely composed of bistratose areolation as well as the upper region of leaf, thus there are found narrow marginal bands. In the lower region of leaves the cells are very lax, with very thin and delicate walls.

Fructification—The male buds and archegonia are terminated on the stem. The former is also located laterally on the stem. Before ripening of the capsule one or more innovations are borne on the base of archegonia or vaginules. Thus the vaginules are usually subtended by innovations or male buds. The inner perichaetal bracts are slightly differentiated from stem leaves and smaller. The bracts are few in number, usually one or two. In the species of *Ptychomitrium* the fruits are rather commonly seen and in Japan the spores ripen in winter. In the central or northern regions of Japan the development of sporophyte proceeds under snow. The number of sporophyte borne in a perichaetium is not always definite. For example, in *Pt. dentatum*, it is usually solitary, but not rarely two or three are found. Thus, *Pt. yakushimense* created according to the number of sporophyte being two or three in a perichaetium, is identical with *dentatum*. In most species of the genus the sporophyte exhibits vast variations, not only in the length of setae but in the size of capsule, operculum and calyptra. In *Pt. sinense*, *formosicum*, *nigricans*, etc. the annulus, being two cells high, is large and distinct, while that of certain members of the genus is scarcely differentiated.

Calyptra—The calyptra is campanulate or mitrate-campanulate in outline and covers perfectly, or most part of the capsule. At maturity the base is indefinitely lobed or laciniated. In certain species, for example in *Pt. dentatum*, its fissures occur less deeply between the keels. The calyptra is distinctly sulcated nearly

through the length, the numerous longitudinal keels are pronounced. Thus its transverse section exhibits a zigzag ring. The upper part lacks keels and is several cells thick uniformly; the cells are small and with strongly thickened walls. In the lower part of calyptra the keels are solidly composed of numerous cells, of which the epidermal ones bear strongly thickened walls. The surface of calyptra is smooth in most part, but the apex is usually covered with conspicuous papillae or fine spines arranged on the keels.

Peristome—The formation of the peristome is of the type seen in the Haplolepideae. The peristome is composed of sixteen teeth arranged in a row. The teeth vary considerably in different species, but there may be recognized two types. In the first type the teeth are rather short, hardly passing into beak, and are covered with rather large papillae on the surface. In the second they are exceedingly long and filiform, reaching near the apex of beak and finely covered with minute papillae.

Each teeth are usually cleft to near the base into two or three, or more, subulate divisions, but in certain cases, for example in *Pt. drummondii*, only the upper parts are slightly cleft into two halves. The number of division is usually definite in each species, but in certain cases, for instance in *Pt. dentatum*, it is somewhat indefinite: the tooth is definitely divided into unequal halves which are occasionally subdivided again.



Fig. 1. Peristome
of *Pt. drummondii*
Sull., $\times 173$.

Affinities

Regarding the systematic status that this genus occupies, there is a considerable divergence of opinion. In the first edition of "MUSCI," Brotherus placed the genus in *Grimmiaceae*. However, in "Laubm. Fenn." and the second edition of "MUSCI," a new family *Ptychomitriaceae* was proposed by the same author for the present genus and *Campylostelium*, and was placed near *Orthotrichaceae*. This idea may be derived from the characteristics of calyptra and of leaves, but it seems to be unsatisfactory one.

The calyptra of the present genus is like that of such genera as *Orthotrichum* and *Ulota*. However, this statement may be also assigned to *Rhacomitrium*. The leaves are also similar to those of *Rhacomitrium* or *Grimmia* not only in its outline but also in the general structure. The areolation of lamina is also like that of the latter two, but lacks sinuous thickenings and papillae which characterize the genera. Regarding the peristome both genera *Ptychomitrium* and *Rhacomitrium* share the most characters in common but both genera are remote from *Orthotrichum* as it belongs to Dipolepidous genus. From the above features it seems better to classify the genus *Ptychomitrium* in *Grimmiaceae*. On this respect the writer has the precedent of G. N. Jones in Grout's Moss Flora, etc.

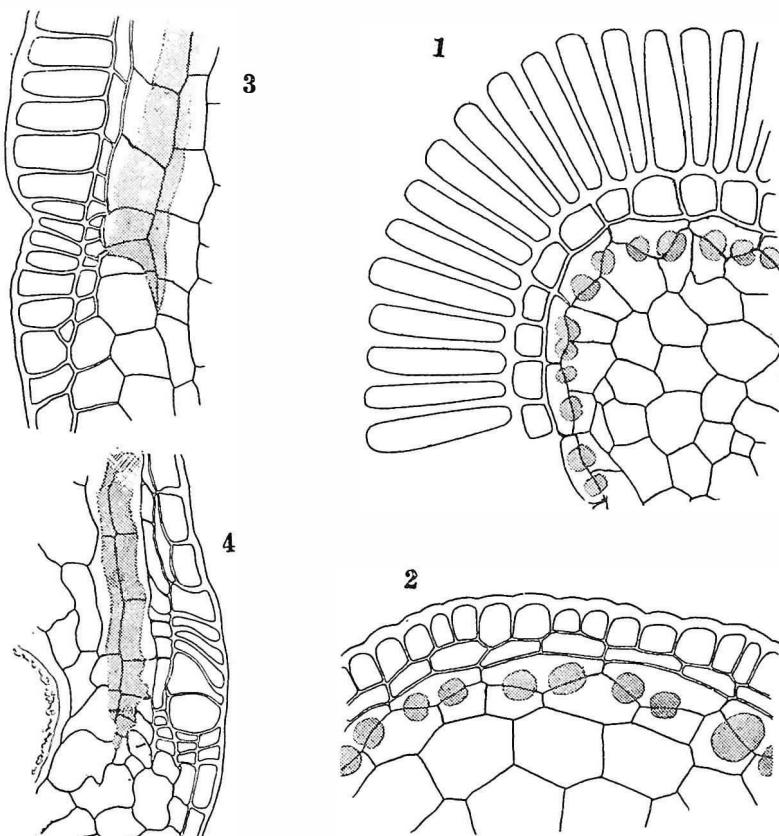


Fig. 2. Sections of peristome, 1, 2 transverse, 3, 4 longitudinal.
 1, *Pt. formosicum* Broth. et Yas., $\times 413$. 2, 3, *Pt. linearifolium* Reim., $\times 327$. 4, *Pt. sinense* Jaeg., $\times 283$.

Geographical distribution and habitat

The genus is largely temperate; its range extends over temperate regions of the world. In Japan *Ptychomitrium* is represented by seven species. None of the species is yet known from the Loo Choo Archipelago. In the alpine regions of Formosa there occurs a well marked species, *Pt. formosicum*. It is noteworthy that the present species is also found in the subalpine regions of central Honshû of Japan; its substratum is not certain. Out of seven species occurring in Japan, *linearifolium* and *dentatum* are most common in the south-western regions. The former species grows on exposed rocks in moist broad leaved forests; its geographical range extends northward to Hokkaidô (Yezo)*, and southward to Kagoshima Prefecture, the southernmost region of Kyûshû. In Japan, *dentatum* grows on exposed rocks by streams in shaded valley. In rainy days the plants are sub-

* E. Ihsiba: Nippon san Senrusisetsu, p. 122 (1929).

merged when water is increased. As far as the writer's examinations are concerned, this species is found in lowland near sea, and also extending up to the montane regions, such as an elevation of about 1000 m. This species is also found in China as far southwest as Hunan. *Pt. wilsoni*, a species closely allied to *dentatum* in the characters of both plant and habit, is confined to Japan. *Pt. fauriei*, also a common

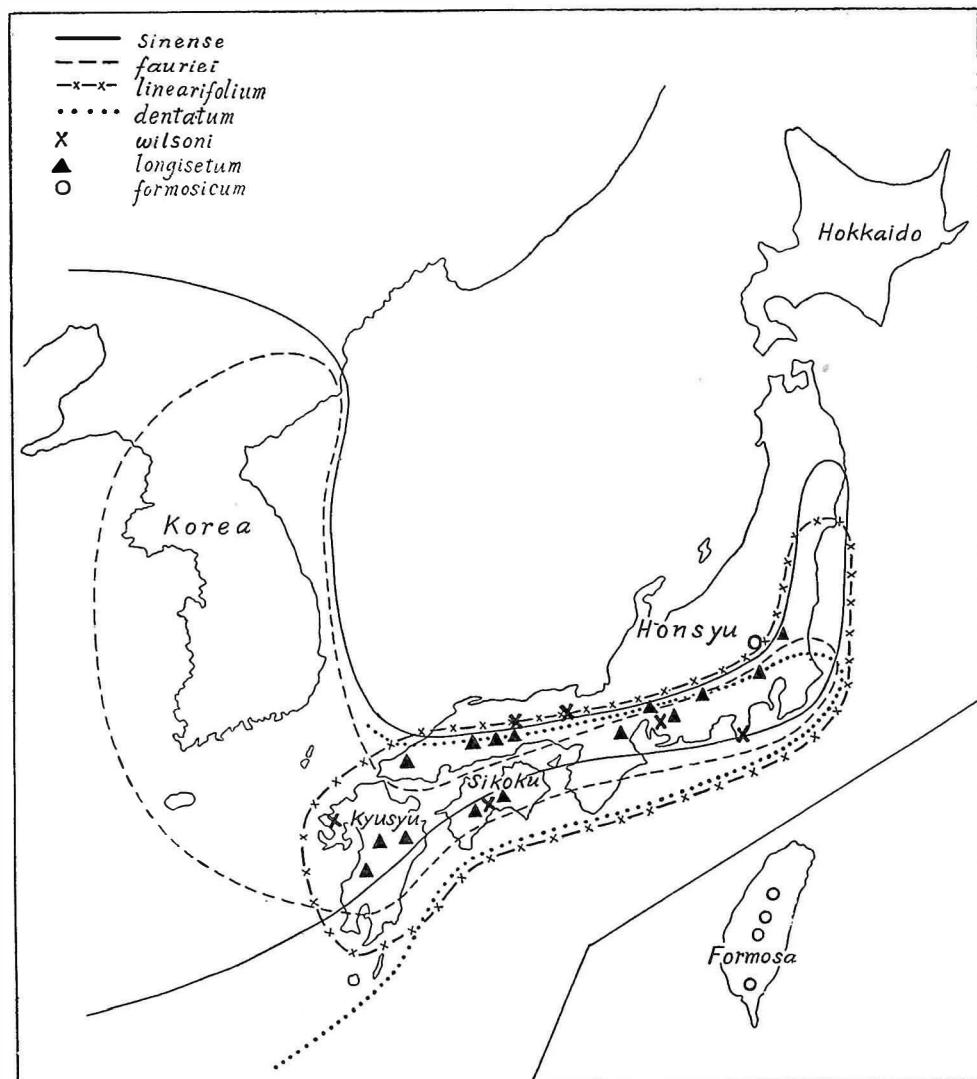


Fig. 3. Range of *Ptychomitrium* spp. in Japan.

species in Japan, grows on rocks somewhat covered with humus or soil in dry and sunny stations. This species extends to North Korea. The habit of *Pt. sinense* is similar to that of *Pt. fauriei*. According to the writer's examinations this species

widely extends northward to Iwate Prefecture, and southward to Kumamoto Prefecture, but it is rather rare in Japan. So far as the writer's examinations are concerned, no collections of the genus have been obtained from the snowy regions of Honshū along the coast of Japan Sea, with few exceptions.

Pt. fauriei is usually found on such a volcanic rock as andesite, but several specimens from central Japan were obtained on clay-slate or hornstone. *Pt. sinense* seems also to be combined with andesite. So far as the writer's examinations are concerned, no specimens have hitherto been collected from the southern parts of Sikoku and Kinki where there are Palaeozoic and Mesozoic rocks. *Pt. linearifolium* usually grows on various kinds of rocks, for example granite, granite-porphyry, rhyolite and andesite, and also occurs on such aqueous rocks as limestone, clay-slate, hornstone, and metamorphic ones. *Pt. dentatum* is usually located on granite, granite-porphyry, andesite and sandstone. *Pt. longisetum* is particular concerning the substratum; it may be worthy of note that this species is confined to exposed limestone.

Classification

Key to the species

- 1 { Leaves entire on the margin, calyptra reaching the base of capsule 2
- Leaves toothed on the upper margin, calyptra reaching the middle of capsule 3
- 2 { Leaves from ovate base linear lanceolate, carinate, cells about 7μ in the middle of leaf, seta reddish, peristome teeth subulate and reddish, spore about 10μ ... *fauriei*
- Leaves linear, concave but slightly carinate, leaf-cells about 10μ , seta yellowish brown, annulus present, peristome teeth linear and yellowish, spore about 20μ *sinense*
- 3 { Leaves broadly linear lanceolate, lingulate or ovate oblong with obtuse apices, capsule narrowly oblong 4
- Leaves from a ovate or oblong base linear lanceolate with acuminate apices, capsule narrowly oblong or cylindrical 5
- 4 { Leaves from a sheathing base linear or linear lanceolate, seta less than 5 mm long, peristome teeth cleft into two long subulate divisions, calyptra shortly rostrate *dentatum*
- Leaves ovate-oblong or lingulate, seta usually more than 5 mm long, peristome teeth rather short, cleft into three or four divisions, calyptra long rostrate *wilsonii*
- 5 { Seta less than 7 mm long *linearifolium*
- Seta usually more than 10 mm long 6
- 6 { Leaves crispat when dry, nearly linear in the upper part, annulus present *formosicum*
- Leaves incurved when dry, linear in the upper part, annulus absent *longisetum*

***Ptychomitrium sinense* (Mitt.) Jaeg. Ad. 1: 382 (1872~73); Besch. in Journ. Bot. 12: 297 (1898); Reim. et Sak. in Bot. Jahrb. 64: 539 (1931).**

Syn. var. *microcarpum* (C. Muell.) Card.; Sak. Bot. Mag. Tokyo, 53: 248 (1939)—*syn. nov.*

***Glyphomitrium sinense* Mitt. in Journ. Linn. Soc. Bot. 8: 149 (1865) et in Trans. Linn. Soc. London, 3: 159 (1891).**

Gl. angustifolium Okam. in Journ. Coll. Sci. Imp. Univ. Tokyo, 38-4: 9 (1916)—syn. nov.

Gl. microcarpum (C. Muell.) Broth. Musci, 1st. ed. 442 (1902).

Ptychomitrium microcarpum (C. Muell.) Par. Ind. 1058 (1897); Salmon in Journ. Linn. Soc. Bot. 17: 455 (1900).

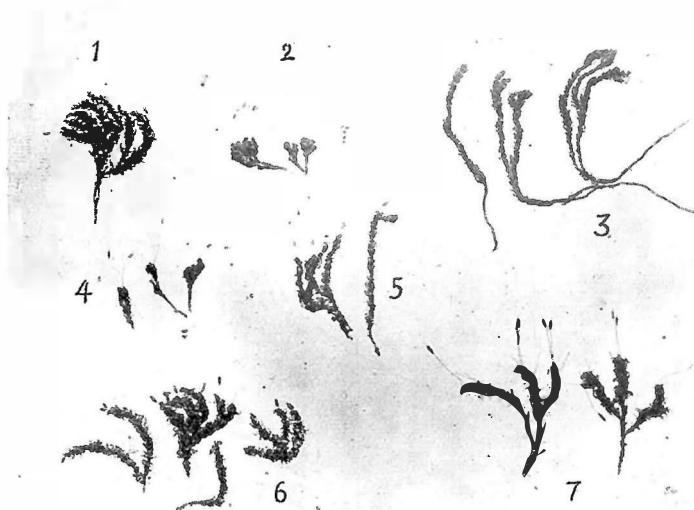


Fig. 4. 1, *Pt. wilsoni*. 2, *Pt. sinense*. 3, *Pt. formosicum*. 4, *Pt. fauriei*. 5, *Pt. linearifolium*. 6, *Pt. dentatum*. 7, *Pt. longisetum*. -All slightly reduced.

Pt. angustifolium (Okam.) Broth. in Engl. et Prant. Nat. Pflanz. Musci, 11: 9 (1925); Sak. I. c. 247 (1939)—syn. nov.

var. *brevipes* Takaki in Journ. Jap. Bot. 25: 192, f. 8 (1950)—syn. nov.

Brachysteleum microcarpum C. Muell. in Nuov. Giorn. Bot. Ital. 3: 107 (1896) et 5: 189 (1898).

Musci Japonici Exsiccati ser. 4, n. 171 (1951); this specimen is unfortunately accompanied by *Pt. fauriei*.

(Figs. 2, 4, 5)

Plants brownish green, in small roundish tufts. Stems reaching 1 cm long, single or with few branches, erect or ascending, densely leaved. Stem leaves incurved when dry, erect-spreading but the apices slightly incurved when moist, linear with acute apex, slightly concave, lower nearly plane not plicate, $2.5 \times 0.5 \sim 3.5 \times 0.8 \sim 4.5 \times 0.9$ mm, margins erect and entire throughout, costa stout, $0.1 \sim 0.13$ mm wide at base, reaching near leaf apex, smooth, cells pellucid, quadrate or subquadrate or rounded hexagonal with thick walls, slightly collenchymatous, the median ones $8 \sim 11 \sim 13 \mu$, the upper about 10μ , the marginal slightly smaller, the basal much larger, lax and hyaline, with thin and delicate walls, long rectangular, $28 \sim 42 \times 10 \sim 15 \mu$. Inflorescence autoicous. Male bud small, solitary at the base of

vaginule or scattered on stem, with several bracts, inner ones widely ovate cymbiform, bearing delicate costa. Inner perichaetal bracts differentiated, smaller and wider than stem leaves. Seta solitary, 5~10 mm long, 0.11~0.13 mm wide, straight,

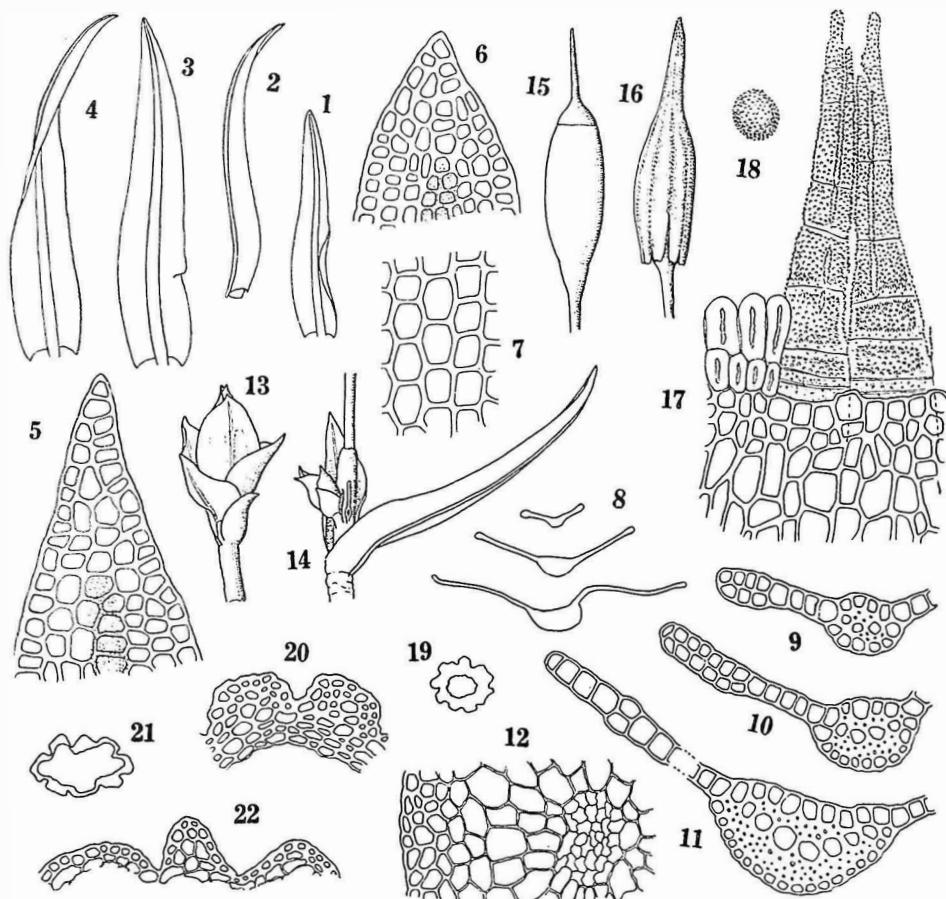


Fig. 5. *Pt. sinense* Jaeg.

1~4, leaves, $\times 11$. 5, 6, leaf apices, $\times 283$. 7, cells from middle of leaf, $\times 413$. 8, transverse sections, smallest one showing that from upper part, $\times 48$. 9~11, ditto (9 upper, 10 middle, 11 lower), $\times 200$. 12, part of cross section of stem, $\times 200$. 13, male bud located among stem leaves, $\times 31$. 14, showing stem leaf, perichaetal bract, male bud and vaginule, $\times 15$. 15, capsule, $\times 15$. 16, ditto bearing calyptra, $\times 15$. 17, peristome, $\times 283$. 18, spore, $\times 283$. 19, 21, transverse sections of capsule (19 upper, 21 lower), $\times 33$. 20, 22, parts of ditto (20 upper, 22 lower), $\times 200$.

smooth, yellowish brown. Capsule erect narrowly oblong or cylindric oblong, neck rather indistinct, yellowish brown, $0.8 \times 0.4 \sim 1 \times 0.5 \sim 1.2 \times 0.55$ mm. Peristome teeth shortly linear-lanceolate rather obtuse, bifid to near the base or longitudinally perforated, remotely articulated, $0.17 \sim 0.25$ mm long, densely and largely papillose,

obscure, yellowish, upper part somewhat pellucid. Annulus distinct and broad, of two rows of large cells. Spores spherical $15\sim20\sim22\mu$ in diam. minutely papillose. Operculum convex, bearing long and slender beak, 0.75~0.85 mm long, over half the length of capsule, yellowish brown. Calyptra campanulate, lobate, extending to the base of capsule when ripened, sulcate, yellowish, upper brownish and scabrous.

Specim. exam. **Kyusyu.** Hukuoka Pref.: Isl. Okinosima (M. Takenouti, May 1933); Ôita Pref.: Yuhuin-mati (A. Noguchi, Aug. 1943), -Yunohira-mura (A. Nog. Oct. 1939), -Mt. Ontake (A. Nog. Nov. 1947), -Beppu (N. Iwasaki, Aug. 1936), -Ôita (A. Nog. Dec. 1938); Kumamoto Pref.: Simomasiki-gun, Samata (Watanabe, Apr. 1947), -Simasaki (Sh. Okamura, July 1907). **Sikoku.** Ehime Pref.: Saidyô, Nagatani (K. Oti). **Honsyu.** Hiroshima Pref.: Kure (M. Inada, Nov. 1931); Okayama Pref.: Udi-mura (T. Iki, June 1951); Hyôgo Pref.: Kamenoyama (T. Nakahara, Feb. 1933), -Kamino-mura (E. Tatebe, Jan. 1951); Aiti Pref.: Mt. Hôraizi (N. Takaki, Aug. 1947); Nagano Pref.: Huse-mura (Sh. Okam. Feb. 1910; Z. Ôhinata Oct. 1911), -A vicinity of Suwa (N. Tak. June 1949 -type of *Pt. angustifolium* var. *brevipes*), -Mt. Ontake, Kurosawaguti, about 1200 m (A. Nog. Aug. 1953); Yamanashi Pref.: Mt. Minobusan (K. Tamura, Dec. 1902); Kanagawa Pref.: Yamakita (K. Hisauti, Feb. 1951-type of *G. angustifolium*), -Onsen-mura (T. Iki, Oct. 1952); Tokyo Pref.: Asakawa-mati (T. Nakazima, Oct. 1929); Saitama Pref.: Arakawa-mura (I. Nagano, Feb. 1953); Miyagi Pref.: Marumori-mati (E. Ihsiba, May 1931); Iwate Pref.: Yanagawa (E. Ihs. July 1907).

Range: Korea, Manchuria and China.

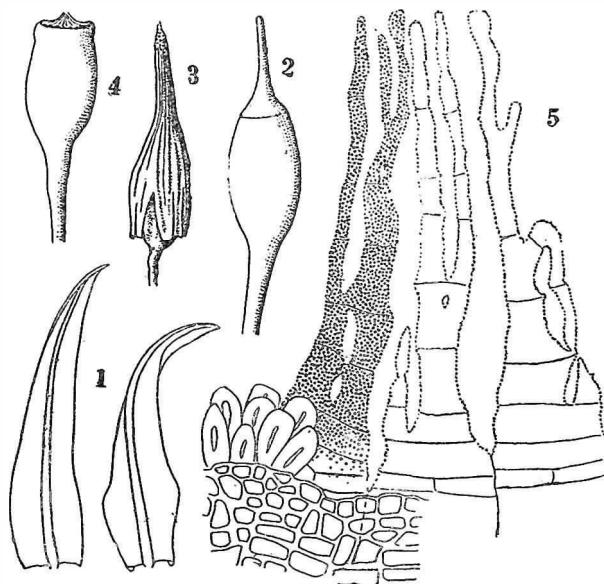


Fig. 6. *Pt. sinense* var. *humile* Nog.

1, leaves, $\times 15$. 2, capsule, $\times 15$. 3, ditto bearing calyptra (when dry), $\times 15$. 4, deoperculate capsule, $\times 15$. 5, peristome, $\times 285$.

As stated in the following page, this species has been confused with *Pt. fauriei*. Examining the type specimen of *Pt. angustifolium*, the writer has found

that this is synonymous with *sinense*. In the features of sporophyte, with the exception of short calyptra, *Pt. nigricans* is allied to the present species, but the form and areolation of leaf are those of *Pt. fauriei*.

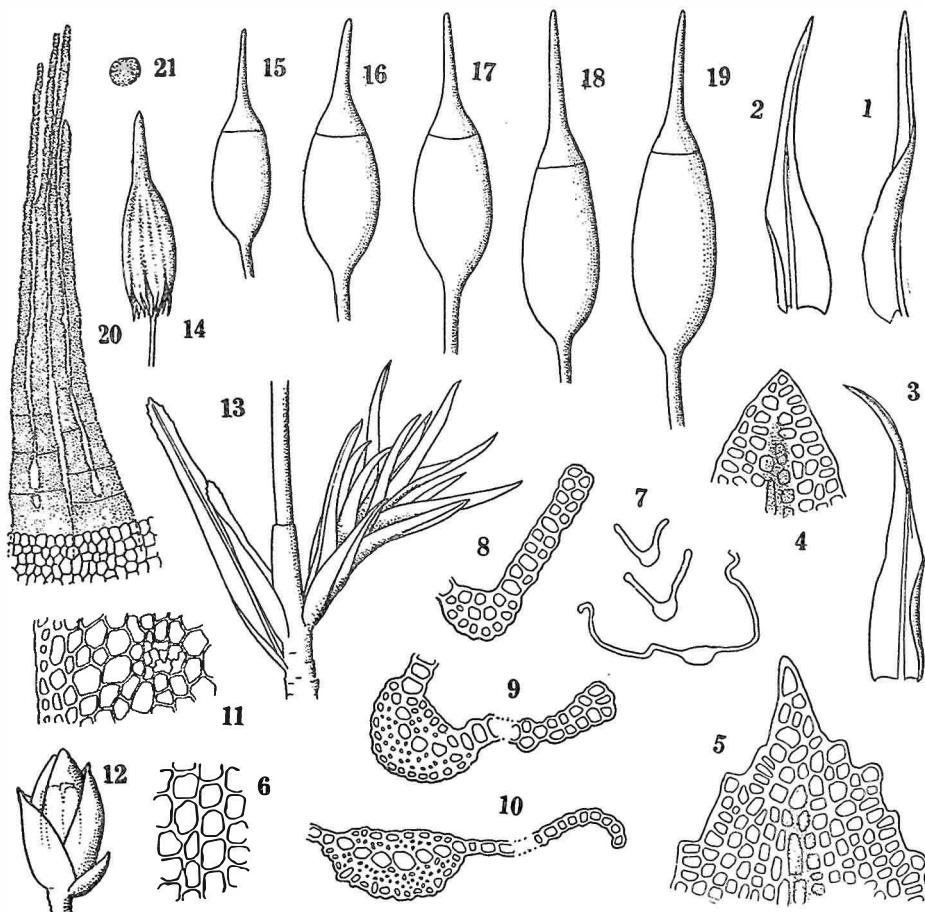


Fig. 7. *Pt. fauriei* Besch.

1~3, leaves, $\times 11$. 4, apex of stem leaf, $\times 283$. 5, apex of upper leaf, $\times 283$. 6, cells from middle of leaf, $\times 347$. 7, cross sections of leaf, $\times 48$. 8~10, ditto (8 upper, 9 middle, 10 lower), $\times 200$. 11, part of cross section of stem, $\times 200$, 12, male bud located among stem leaves, $\times 31$, 13, showing perichaetial bract, innovation and vaginule, $\times 15$. 14, capsule bearing calyptra (when dry), $\times 11$. 15~19, capsules, $\times 15$. 20, peristome, $\times 140$. 21, spore, $\times 347$.

var. **humile** Noguchi, var. nov. (Fig. 6)

A typo differt: planta minor, caulis ad 3 mm altus, seta ad 2 mm longa, peristomii dentes irregulariter 2-fissi.

Honsyu. Ōsaka Pref.: Sano-mati (T. Nakazima, Dec. 1934).

Ptychomitrium fauriei Besch. in Journ. Bot. 12: 297 (1898); Salmon in Journ.

Linn. Soc. **17**: 455 (1900); Sak. in Bot. Mag. Tokyo, **53**: 247 (1939); Nog. in Journ. Jap. Bot. **29**: 83 (1954).

Syn. *Pt. sinense* (non Jaeg.) Sak. l. c.

Pt. sinense var. *intermedium* Sak. l. c. 248 (1939)—syn. nov.

Pt. brevisetum Dixon, apud Sak. l. c. 248, f. 2 (1939); Tak. in Journ. Jap. Bot. **25**: 191 (1950)—syn. nov.

Pt. rhacomitrioides (non Dixon, 1937) Sak. in Bot. Mag. Tokyo, **56**: 222, f. 9 (1942)—syn. nov.

Glyphomitrium saurieei (Besch.) Broth. in Musci, 1st ed., 44 (1902).

Holomitrium ebracteatum Dix. in Trav. Bryol. **1**: 10 (1942).

(Figs. 4, 7)

Plants dark green or blackish below, yellowish green above, forming irregular tufts. Stems reaching 2 cm long, simple or with few branches, densely leaved. Stem leaves circinate-incurved when dry, erect-spreading, the upper part slightly incurved and carinate when moist, from a ovate base rather rapidly linear-lanceolate with acute and somewhat cucullate apex, the lower involute, 3~4 mm long, margins entire but in the upper leaves toothed, costa percurrent or vanishing beneath the leaf apex, about 0.09 mm wide at base, cells obscure, the median ones rounded quadrate with incrassate walls, 5~7~8.5 μ , the upper about 7 μ , the basal lax and hyaline, long rectangular with thin and delicate walls, 40~55 \times 12~15 μ . Inflorescence autoicous, male buds one or two, at the base of vaginule and located on stem, bearing several bracts, inner bracts widely ovate, apex obtuse, with delicate costa. Inner perichaetal bracts similar to stem leaves but much smaller, with several small teeth on upper margins. Seta solitary, slender, reddish, slightly flexuose when dry, smooth, 3~10~22 mm long, about 0.13 mm wide. Theca erect, narrowly ovate-oblong or oblong, yellowish brown, 1 \times 0.5~1.2 \times 0.7~1.5 \times 0.7~1.7 \times 0.85 mm. Annulus slightly differentiated. Peristome teeth linear, slightly attenuated, bifid to near the base, brownish red, densely and finely papillose, 0.5~0.9 mm long. Spores spherical or ovate, indistinctly papillose or nearly smooth, 9~13 μ in diam. Operculum conical subulate, with long and erect beak, lower reddish, upper yellowish, usually over half the length of capsule, 0.7~1~1.3 mm long. Calyptora campanulate, deeply sulcate, lower strongly laciniate, covered the entire capsule, yellowish brown, upper blackish, nearly smooth, 2~3 mm long.

Specim. exam. **Kyusyu**. Nagasaki Pref: Nagasaki (U. Faurie, n. 15372 -type, Mar. 1895); Kumamoto Pref.: Nisize (K. Maebara, longisetum!), -Watari (K. May. June 1936), -Hukabayama (N. Takaki, Oct. 1946, longisetum!), -Simomasikigun, Toda~Nihonmatsu (Y. Nisihiara, May 1953), -Mt. Itihusa (H. Kaneda, n. 229, July 1935 -type of *Pt. rhacomitrioides*), -Mt. Syakain (N. Tak. Sept. 1946, longisetum!), -Nisikino-mura (N. Tak. Aug. 1934, longisetum!), -Mt. Kurobaru (K. May. Apr. 1936, as *sinense* det. by Sakurai), -Kozyô-mura (Y. Watanabe, June 1947), -Hakusui-mura (H. Takahasi, Aug. 1938), -Iwanomura (N. Tak. Jan. 1941); Miyazaki Pref.: Mt. Kirisima (N. Iwasaki, May 1937, longisetum!; R. Koto, Aug. 1950, longisetum!), -Mt. Kunimidake (Y. Kuwahara, Aug. 1951, longisetum!), -Mt. Hutakami (A. Noguchi, Aug. 1939, longisetum!); **Oita Pref.**: Yunohira-mura (A. Nog. Aug. 1938 & Aug. 1950), -Ôno-mati, Zinkakuzi (A. Nog. Aug. 1948), -Mt. Sobo, about 600 m (A. Nog. Oct. 1952, longisetum!), -Tenzinyama-mura (A. Nog. Nov. 1949), -Beppu, Kannawa (N. Iwas. Aug. 1936 -type of *Pt. sinense* var. *intermedium*),

-Mt. Yuhu (A. Nog. Oct. 1938, brevisetum !), -Hukayabakei (A. Nog. Nov. 1946, longisetum !); Hukuoka Pref.: Mt. Inugatake (M. Takenouti, May, 1932). **Sikoku.** Kōti Pref.: Takimoto (Sh. Okamura, Jan. 1904, as *wilsoni* det. by Brotherus), -Umadi (Sh. Okam. Aug. 1905, longisetum ! as *sinense* det. by Broth.), -Mt. Kuisi (Sh. Okam. Aug. 1905, longisetum ! as *sinense* det. by Broth.), Mt. Yanaze (Sh. Okam. Aug. 1905, longisetum ! as *sinense* det. by Broth.), -Mt. Kokuzō (M. Kamimura, Oct. 1934, longisetum !), -Mt. Hōnokawa (M. Kam. Nov. 1933, longisetum !), -Sinzyō-mura (M. Kam. June 1934, longisetum !), -Taishō-mura (H. Wada, Feb. 1930, longisetum !), -Ogawa-mura (M. Kam. Mar. 1939, longisetum !), -Sugi-mura (A. Nog. Mar. 1928); Ehime Pref.: Bessiyama-mura (K. Oti), -Kamo-mura (K. Oti); Tokushima Pref.: Mt. Dairyūzī (S. Murai, Mar. 1932, longisetum !), -Kareidaki (Sh. Okam. Dec. 1905, n. 333, longisetum ! as *Glyphomitrium sinense* var. *longisetum* Broth. det. by Brotherus). **Honsyu.** Ōsaka Pref.: Mt. Takazyō (T. Nakazima, Nov. 1933), -Makio (Nak. May 1936), -Mt. Katuragi (T. Nak. Mar. 1936), -Kaiduka (T. Nak. Mar. 1952, brevisetum !), -Simamoto-mati (M. Mizutani, Dec. 1953); Wakayama Pref.: Mt. Gomadan (T. Nak. Mar. 1936), -Kamihaya-mura (N. Iwas. Jan. 1930), -Kamiakitu-mura (M. Kurita, Dec. 1932), -Mizunodaisi (Y. Tutiga, May 1931), -Ryūzin-mura (T. Nak. Mar. 1936), -Mt. Kōya (M. Kur. July 1932), -Akitugawa-mura (T. Nak. Dec. 1932); Mie Pref.: Mt. Gozaisyo (M. Kur. Jan. 1933, longisetum !; H. Matuoka, Aug. 1936), -Mt. Ōdaigahara (T. Nak. Mar. 1949), -Nakasima-mura (T. Magohuku, Aug. 1937), -Hukaizawa-mura (Sh. Okam. Nov. 1913, as *sinense* det. by Okam.); Hyōgo Pref.: Hōkidani (K. Yamamoto, Nov. 1949), -Rurikei (K. Yam. Jan. 1951); Nara Pref.: Mt. Ikoma (K. Yam. Sept. 1945), -Mt. Tabuhō (T. Nak. Nov. 1952), -Murōzī (N. Tak. Dec. 1948); Siga Pref.: Mt. Hira (K. Yam. Apr. 1935), -Mt. Hiei (K. Yam. Feb. 1933); Aiti Pref.: Ōnomura (N. Tak. Jan. 1949), -Damine (N. Tak. Mar. 1950, brevisetum !), -Sakauba (N. Tak. Nov. 1951), -Taguti-mati (N. Tak. Jan. 1950 & Apr. 1950, longisetum !), -Adera (N. Tak. Jan. 1949, longisetum !), -Mt. Hōraizi (N. Tak. May 1949), -Toyone-mura (N. Tak. June 1950, brevisetum !), -Mt. Danto (N. Tak. Oct. 1948, longisetum !); Sizuoka Pref.: Ōmagawadamu (N. Tak. July 1951, longisetum !), -Amagi Pass about 800 m (I. Nagano, Mar. 1953, longisetum !); Yamanashi Pref.: Syōsenkyō (N. Tak. Nov. 1942); Nagano Pref.: a vicinity of Iida (K. Tanada, Sept. 1953), -Mt. Ontake (Y. Ikegami, July 1946), -Ozika-mura (N. Tak. July 1949); Kanagawa Pref.: without definite station (M. Suzuki, Sept. 1920), -Yugawara (T. Nak. Aug. 1937); Saitama Pref.: Urayama-mura, about 600 m, on clay-slate and hornstone (I. Nag. Aug. 1952), -Ōmiya (M. Ogisima, Nov. 1950); Tiba Pref.: Matudo (Y. Sugihara, Oct. 1932); Ibaraki Pref.: Siino-mura (H. Sasaoka, n. 487 -type of *Holomitrium ebracteatum*, May 1929); Totiki Pref.: Nikko (E. Ihsiba, Nov. 1931).

Range: Korea.

Bescherelle states in his original description of this species as follows: "Folia, e medio ad apicem usque eroso-dentata,". This statement has been perplexed the later bryologists. The writer has examined the type specimen preserved in the herbarium of Kyoto University. The leaves are usually entire excepting the apical ones or perichaetal bracts, instead of Bescherelle's description. This was already discussed by Salmon in 1900. Comparing *Pt. sinense*, he states, "In *P. sinense* the leaves are much broader, always triangular in outline, with a broad upper part which is not or scarcely cucullate, and the cells are distinctly larger averaging 10 μ ; in *Pt. fauriei* the leaves are long and narrow in the upper part and strongly cucullate, with the cells averaging 7 μ ". Furthermore, *Pt. fauriei* is separated from *sinense* by its flexuose, reddish seta, and ovate-cylindric capsule, being widest at lower part, and also short and yellow teeth. This species has been misunderstood by several bryologists. Furthermore, due to the vast variability of

the size of sporophyte, several synonyms have been published. Indeed, it is not easy to distinguish the two when the plants lack sporophytes. The writer has examined the type specimens of *Pt. rhaconitrioides*, *brevisetum* and *Holomitrium ebracteatum* and found that they evidently represent one and the same species. The seta shows a wide range of variation in its length. In many specimens from various parts of Japan, it reaches 22 mm in length, while in several specimens it is less than 5 mm. The latter is the case, for example, with *Pt. brevisetum* originally described by Sakurai on a specimen bearing old deoperculate capsules. There are, however, all gradations between these extremes. But, it may be noted that the longer type of seta is rather ranged in south western Japan. It seems, therefore, not advisable to segregate them from the normal type as distinct species or varieties. As noted above, *Pt. brevisetum* established by its shorter seta and small capsule, seems to be hardly distinct enough for recognition. In both types the

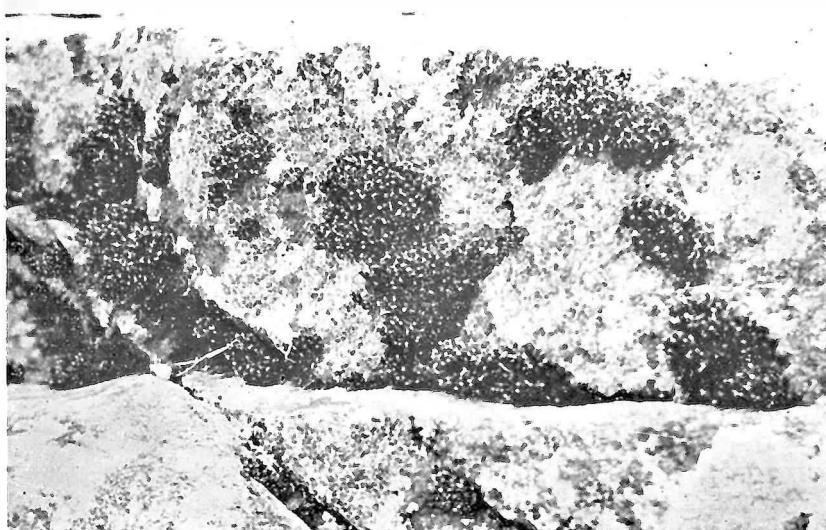


Fig. 8. *Pt. dentatum* Jaeg. growing on granite-porphry
(Hasegawa-mura, Ono-gun, Oita Pref., Kyusyu)

character of the peristome is much the same.

Ptychomitrium dentatum (Mitt.) Jaeg. Ad. 1: 380 (1872~73); Besch. in Journ. Bot. 12: 297 (1898); Sak. in Bot. Mag. Tokyo, 53: 249 (1939).

Syn. *Glyphomitrium dentatum* Mitt. in Journ. Linn. Soc. 8: 149 (1865) & in Trans. Linn. Soc. London, 3: 159 (1891); Lindb. in Act. Soc. sci. fenn. 10: 229 (1872).

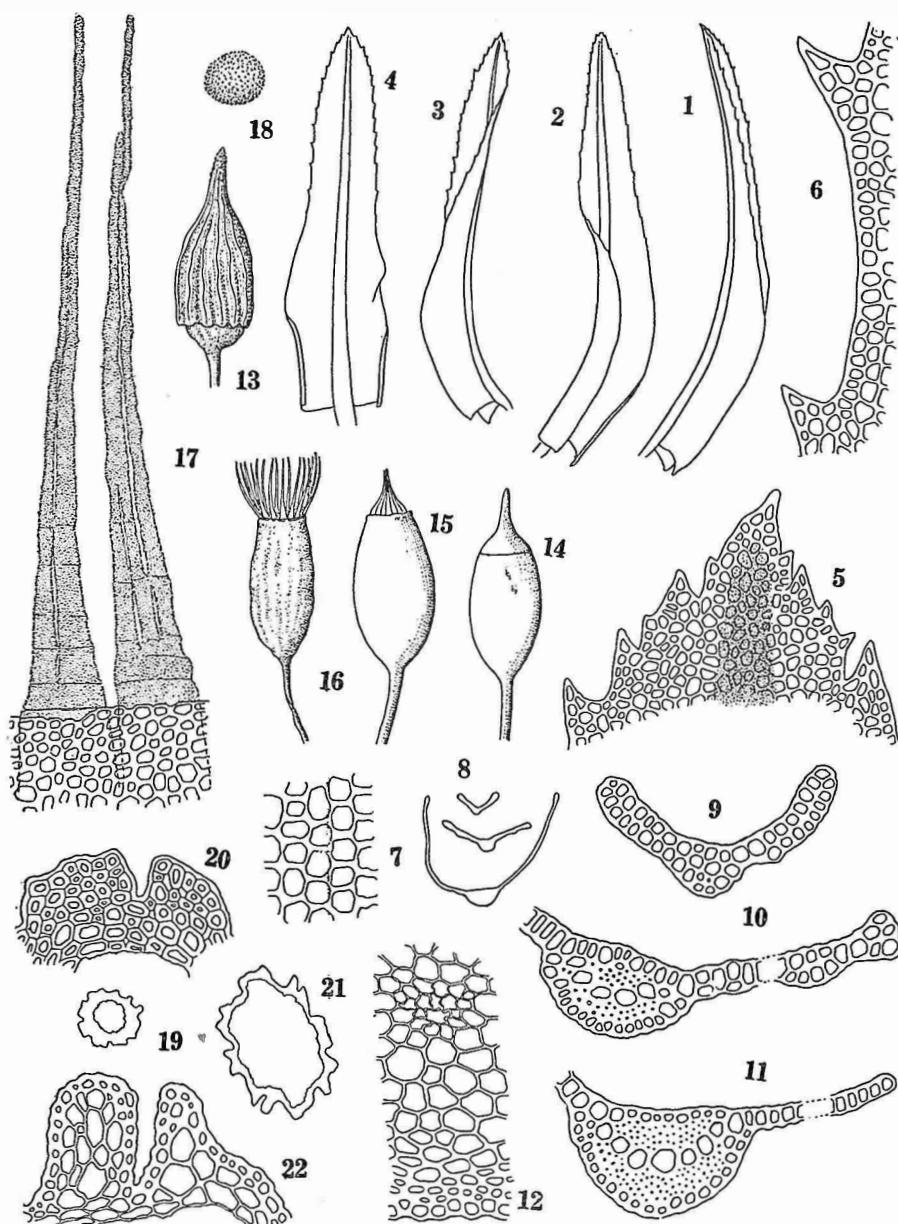
Ptychomitrium yakushimense Sak. in Bot. Mag. Tokyo, 50: 262, f. 2 (1936)
—syn. nov.

Musci Japonici Exsiccati, ser. 5, n. 244 (1951)
(Figs. 4, 8, 9, 10)

Plants blackish green in roundish tufts. Stems usually 1~2 cm occasionally 5 cm long, simple or with few elongated branches, densely leaved. Stem leaves incurved

when dry, widely spreading or somewhat recurving when moist, inferior ones small about 2×0.6 mm, superior larger, reaching 4.5×1 mm, from a vaginate involute base lingulate or widely linear-lanceolate, apex acute or obtuse, occasionally rounded or acuminate, upper carinate, not plicate, margins plane bearing large but remote teeth upper half, teeth of leaf apex somewhat aggregate, composed of several cells, costa vanishing beneath the leaf apex, stout, about 0.15 mm wide at base, cells obscure, the median ones quadrate or rounded quadrate with incrassate walls, slightly collenchymatous, $7 \sim 9 \mu$, basal lax and hyaline with thin and delicate walls, rectangular or oblong-hexagonal $30 \sim 45 \times 10 \sim 15 \mu$. Inflorescence autoicous. Male buds on the base of vaginule or scattered on stem, with several bracts, inner bracts ovate, usually ecostate. Perichaetial bracts scarcely differentiated. Seta 1 or 2~3-aggregate, $2 \sim 3 \sim 5$ mm long, about 0.15 mm broad, reddish brown, smooth. Theca erect, ovate or oblong-ovate, yellowish brown, $1.2 \times 0.7 \sim 1.5 \times 0.85 \sim 2 \times 1$ mm. Annulus hardly differentiated. Peristome teeth linear-lanceolate, straight, long and finely subulate, $0.7 \sim 1$ mm long, brownish red, densely minutely papillose, bifid to near the base, occasionally the halves bifid again at the lower part, the divisions often unequal in length, erect-spreading when dry. Spores spherical or elliptic or ovate, minutely papillose, $14 \sim 17 \sim 22 \mu$ in diam. Operculum from a convex base long rostrate, almost half the length of capsule, $0.8 \sim 1.2$ mm long, reddish brown. Calyptra campanulate, sulcate, lower rather indistinctly lobate, apex blackish and scabrous, about 2 mm long, extending below the middle of capsule when ripe.

Specim. exam. **Kyusyu.** Kagoshima Pref.: Isl. Yakushima, about 1000 m, (Y. Doi, Dec. 1934 -type of *Pt. yakushimense*; Hasegawa, Apr. 1950; K. Maebara, July 1951), -Mt. Takakuma (A. Noguchi, Aug. 1931), -Hetuka (A. Nog. May 1933); Miyazaki Pref.: Mimata-mura (A. Nog. Aug. 1927), -Nakagō-mura (T. Nakahara, Aug. 1932), -Kitago-mura, on Sandstone (A. Nog. Apr. 1946, S. Hattori & T. Kurata, Apr. 1947), -Mt. Osuzu (Y. Kuwahara, Aug. 1950); Kumamoto Pref.: Aida-mura (K. Maeb. n. 639, as *Pt. kiusiuense* det. by Sakurai, Apr. 1936), -Issyōti-mura (H. Takahashi, Dec. 1934), -Hitoyosi (K. Maeb. Oct. 1951), -Mt. Siraga (A. Nog. July 1931), -Mt. Yatake (A. Nog. Aug. 1931), -Kamotogun, Oninodō (N. Takaki, Aug. 1934), -Mt. Hukaba (N. Tak. Oct. 1946), -Mt. Kinpo (Watanabe, Apr. 1947); Ōita Pref.: Hasegawa-mura, Obira, about 800 m, on granite-porphry (S. Sato, Dec. 1953), -Mt. Sobo, on granite-porphry (A. Nog. Oct. 1952), -Yunohira-mura (A. Nog. Aug. 1938), -Aoyama-mura (A. Nog. Sept. 1947), -Hukayabakei (A. Nog. Aug. 1947). **Sikoku.** Kōti Pref.: Taisyō-mura (H. Wada, Feb. 1930), -Mt. Nonogawa (H. Wada, Feb. 1930), -Mt. Yanaze (K. Yamamoto, Nov. 1938), -Mt. Sōdayama (M. Kamimura, Oct. 1934), -Mt. Ionogi (M. Kam. Dec. 1932), -Ekawasaki (M. Kam. July 1932), -Takimoto (Sh. Okam. Jan. 1904), -Mt. Imano (Sh. Okam. Aug. 1905); Tokushima Pref.: Higasiiyadani-mura (H. Oti, May 1953, brevisetum!), -Kareidaki (Sh. Okam. Dec. 1905). **Honsyu.** Yamaguti Pref.: Yamaguti (S. Matumoto, July 1932, longisetum!), -Tyōmonkyō (S. Mat. Mar. 1932); Hiroshima Pref.: Mt. Siraki (S. Mat. Nov. 1931), -Hiro-mura (M. Inada, Apr. 1930), -Minotimura (A. Nog. Apr. 1928); Ōsaka Pref.: Mt. Inunaki (T. Nakazima, Feb. 1936 & Feb. 1937); Nara Pref.: Mt. Murōzī (T. Nak. Dec. 1948); Mie Pref.: Akamedaki (T. Nak. Nov. 1934; N. Tak. Dec. 1948), -Mt. Ōdaigahara (N. Tak. Aug. 1948); Wakayama Pref.: Mt. Nati (Y. Tutiga, Mar. 1931; M. Kurita, Dec. 1932; S. Mat. Mar. 1941; T. Nak. Nov. 1953), -Kitayama-mura (M. Hirano, Oct. 1951), -Hanazono-mura (T. Nak. Mar. 1936), -Iwata-mura (N. Iwasaki, Aug. 1929), -Mihune-mura (K. Murata, Aug. 1926), -Ryūzin-mura (M. Mizutani, Aug. 1948), -Mt. Kōya (M. Kur. July 1932); Siga Pref.: Ōisi-mura (K. Yamamoto, Feb. 1933); Aiti Pref.: Nanasato-mura (N. Tak. Feb. 1949), -Miwa-mura (N. Tak.

Fig. 9. *Pt. dentatum* Jaeg.

1~4, leaves, $\times 15$. 5, leaf apex, $\times 200$. 6, mid margin of leaf, $\times 283$. 7, cells from middle of leaf, $\times 347$. 8, cross sections of leaf, $\times 33$. 9~11, ditto, $\times 200$. 12, part of cross section of stem, $\times 200$. 13, capsule bearing calyptra (when dry), $\times 11$. 14, capsule, $\times 11$. 15, 16, deoperculate capsule (16 when dry), $\times 11$. 17, peristome, $\times 140$. 18, spore, $\times 347$. 19, 21, cross sections of calyptra (19 upper, 21 lower), $\times 33$. 20, 22, parts of ditto (20 upper, 22 lower), $\times 200$.

Sept. 1949), -Adera (N. Tak. Feb. 1949); Sizuoka Pref.: Amagi Pass, about 700 m (I. Nagano, Mar. 1953); Tokyo Pref.: Okutama (H. Tak. Feb. 1939). **China**, Hunan (W. T. Tsang, Mar. 1934).

Range: China, Jap.

The apex of leaves is usually obtuse or widely acute, but in certain cases, it is narrowly attenuated and the marginal teeth are less pronounced. Such examples are usually found in the specimens bearing longer setae. The length of seta is variable. In several specimens it attains 5 mm, but in others it is exceedingly short. The former exhibits several gradations from *dentatum* to *wilsoni*.

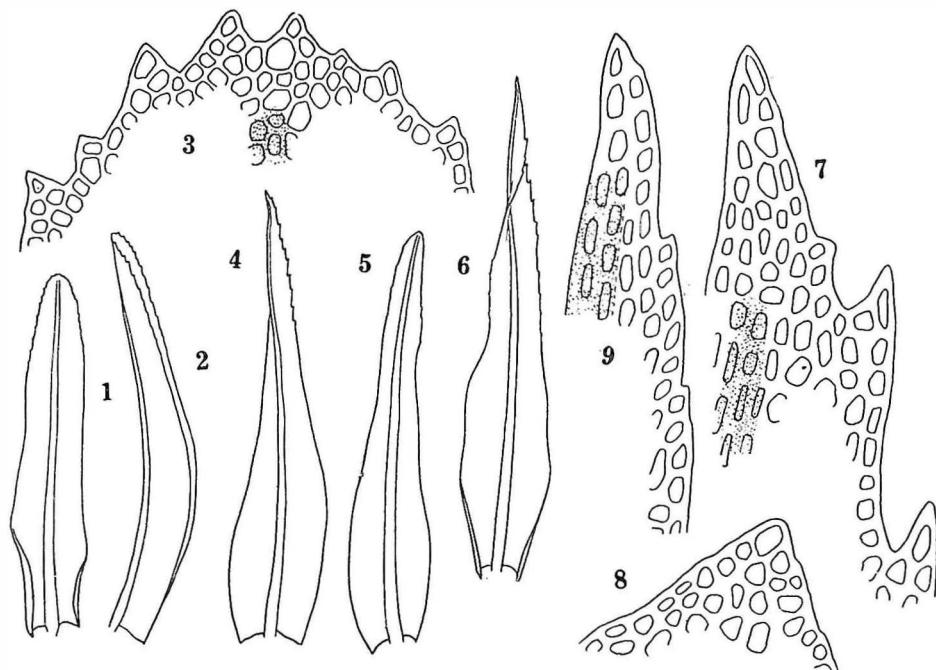


Fig. 10. *Pt. dentatum* Jaeg.

1, 2, 4, 5, 6, leaves, $\times 15$. 3, 7, 8, 9, apices of leaves, $\times 327$. 1~3 from Mt. Shiraki, Hiroshima Pref., the others from Yamaguti.

Ptychomitrium wilsoni Sull. et Lesq. in Proc. Amer. Acad. Art. Sci. 4: 277 (1859).

Syn. *Glyphomitrium wilsoni* (Sull. et Lesq.) Mitt. in Trans. Linn. Soc. Bot. III-3: 159 (1891).

G. brevidens Broth. in Hedwigia, 38: 214 (1899).
(Figs. 4, 11)

Plants robust, blackish-green, forming roundish tufts. Stems usually dendroid, reaching 4 cm long or more, the upper part somewhat curved, densely leaved. Leaves loosely incurved when dry, erect-spreading when moist, ovate-lanceolate or ovate-lingulate with widely acute or subobtuse apices, slightly carinate not plicate,

$4 \times 1.3 \sim 5.5 \times 1.5$ mm, margins largely toothed upper half, lower slightly involute. Costa stout, about 0.13 mm broad at base, vanishing beneath leaf apex, cells almost obscure, the median ones subquadrate with strongly incrassate walls, slightly collenchymatous, $7 \sim 9 \mu$ in diam. basal lax and hyaline, rectangular or subrectangular

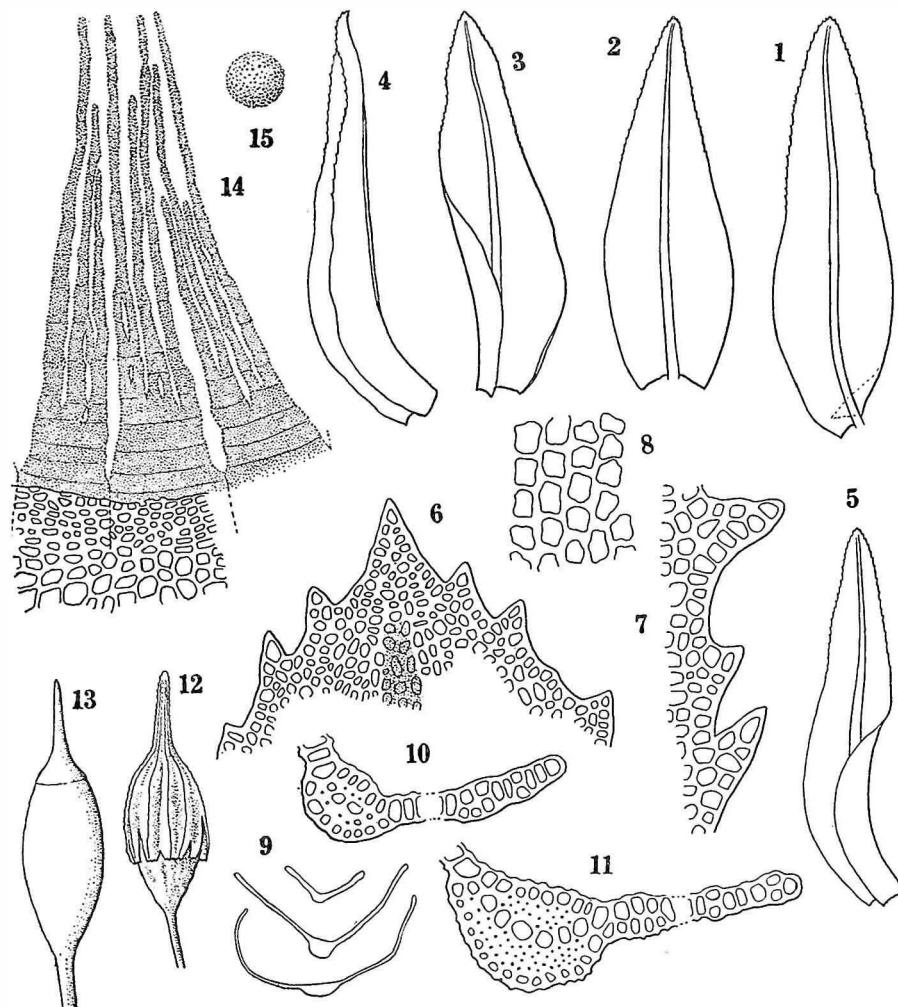


Fig. 11. *Pt. wilsoni* Sull. et Lesq.

1~5, leaves, $\times 11$. 6, leaf apex, $\times 200$. 7, mid margin of leaf, $\times 283$. 8, cells from middle of leaf, $\times 347$. 9, cross sections of leaf, $\times 33$. 10, 11, ditto, $\times 200$. 12, capsule bearing calyptra (when dry), $\times 11$. 13, capsule, $\times 11$. 14, peristome, $\times 140$. 15, spore, $\times 283$.

with thin walls, $20 \sim 30 \times 9 \sim 13 \mu$. Male buds with few bracts, inner bract ovate. Perichaetial bracts hardly differentiated. Seta rigid, yellowish or yellowish brown, $4 \sim 6$ mm long, 0.15 mm wide. Capsule erect, oblong, yellowish brown, $1.5 \times 0.8 \sim$

1.8×0.9 mm. Annulus hardly differentiated. Peristome teeth lanceolate or linear-lanceolate, densely and minutely papillose, $0.35 \sim 0.45 \sim 0.6$ mm long, 3~4 usually 3-cleft to near the base, the divisions unequal in length, reddish brown below, yellowish above. Spores spherical or subspherical or ovate, minutely papillose, $20 \sim 27 \sim 37 \times 27 \mu$ in diam. Operculum from a convex base long rostrate, reddish brown, almost half the length of capsule, $1.2 \sim 1.5$ mm long. Calyptra campanulate, lobate at base, sulcate, scabrous, brown, $1.5 \sim 2.2$ mm long, reaching to the middle of capsule.

Specim. exam. **Kyusyu.** Nagasaki Pref.: Mt. Kurokami (M. Takenouti, Feb. 1933; M. Kurita, May 1937). **Sikoku.** Kôti Pref.: Tosa-gun, Hirose (Sh. Okamura, June 1904, as *Pt. dentatum* det. by Brotherus). **Honsyu.** Okayama Pref.: Ikeda-mura (T. Iki, Feb. 1950); Kyôto Pref.: Rurikei (K. Yamamoto, Jan. 1951); Hyôgo Pref.: Ôe-mati (T. Nakazima, May, 1953); Aiti Pref.: Kitasidara-gun, Kaai (N. Tak. Aug. 1947), -Nanashato-mura (N. Tak. Feb. 1949).

Range: confined to Japan.

The original description of *Pt. wilsoni* made by Sullivant and Lesquereux is so brief that it is difficult to recognize the species by the literature only. However, their statement "perist. dentibus subtrifidis hic illic pertusis . . ." seems to be an unique feature that characterizes the species. By Reimer's account* on this species and by the original description of *Pt. brevidens*, a synonym of this species, the writer was able to recognize the present species in full.

Most of the descriptions about leaf-shape, costa, serration and areolation of *Pt. dentatum* will also apply to those of *wilsoni*, but the leaves of the latter are usually much wider. Corresponding with the length of operculum the length of peristome varies; in certain cases the teeth are considerably long and attenuated but are commonly shorter than those of *dentatum*. What may be an intermediate type of sporophyte is found in the specimens from Kôti or Kyôto. As stated above, *dentatum* and *wilsoni* grow on wet exposed rocks by stream and are frequently submerged in water in rainy times. To the writer's mind the species is much more allied to *dentatum* than to *linearifolium*. As two species share several essential characters in common, it is not easy to draw sharp distinctions between them.

Ptychomitrium linearifolium Reim. in Bot. Jahrb. **64**: 539 (1931); Sak. in Bot. Mag. Tokyo, **53**: 249 (1939).

Syn. *Glyphomitrium wilsoni* (non Sull. et Lesq.) Okam. in Icon. Pl. Koish. **3-2**: 39, t. 165 (1916).

Musci Japonici Exsiccati, ser. 2, n. 71 (1948) & ser. 7, n. 343 (1953)
(Figs. 2, 4, 12, 13)

Plants dark green, the upper green, forming roundish tufts. Stems ascending, simple or bearing few elongated branches, reaching 6 cm long, flexuose, rather densely leaved. Stem leaves crispatate incurved when dry, widely spreading or somewhat reflexing when moist, from a ovate base reflexing, long linear, apex narrowly acute or acuminate, arcuate recurved, upper carinate, lower concave and slightly plicate, $3 \sim 5 \sim 6.5$ mm long, margins largely and remotely toothed upper half, the teeth composed of several cells, lower somewhat revolute and entire, costa vanishing beneath the leaf apex, about 0.15 mm late at base, cells rather pellucid rounded

* Bot. Jahrb. **64**: 540 (1931).

quadrate with strongly thickened walls, somewhat collenchymatous, the median ones $5\sim 8 \mu$ in diam. basal lax and hyaline, rectangular with thin walls, $30\sim 40 \times 13\sim 15 \mu$. Male buds with few bracts, inner bract ovate-cymbiform, usually ecate. Perichaetal bracts scarcely differentiated. Seta solitary or two aggregated,

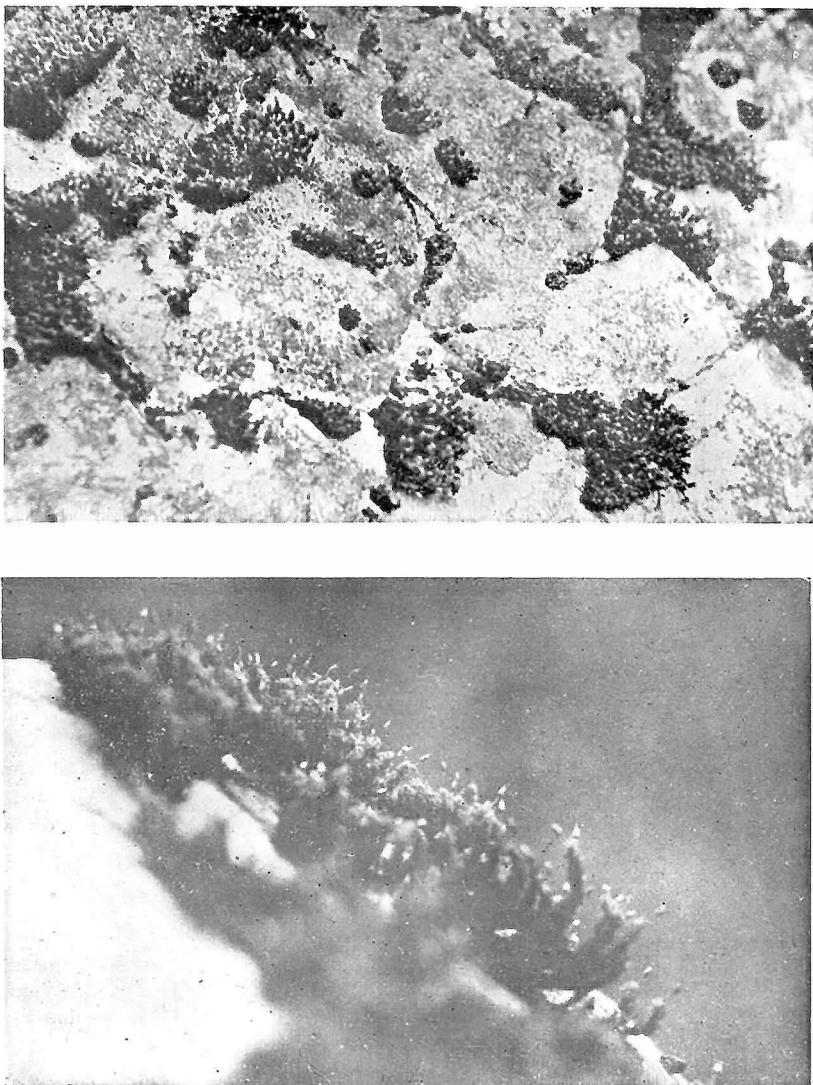


Fig. 12. *Pt. linearifolium* Reim. growing on granite-porphry
(Hasegawa-mura, Ôno-gun, Ôita Pref., Kyusyu)

yellowish brown, $2.5\sim 4\sim 7$ mm long, 0.1 mm wide. Capsule erect, oblong or narrowly oblong, yellowish, $1 \times 0.5\sim 1.5 \times 0.7\sim 2 \times 0.9$ mm. Annulus hardly differentiated. Peristome teeth from a linear-lanceolate base long and straightly subulate, bifid to

near the base, occasionally irregularly trifid at base, divisions frequently unequal in length, erect-spreading when dry, reddish brown, minutely and densely papillose, reaching 0.6 mm occasionally 0.8 mm long. Spores spherical, smooth or indistinctly and minutely papillose, $8.5\sim12\ \mu$ in diam. Operculum from a conical base long rostrate, lower reddish brown, almost half the length of capsule, 0.85~1 mm long. Calyptora campanulate, sulcate, lower lobate, reaching below the middle of capsule, 1.7~2 mm long yellowish brown.

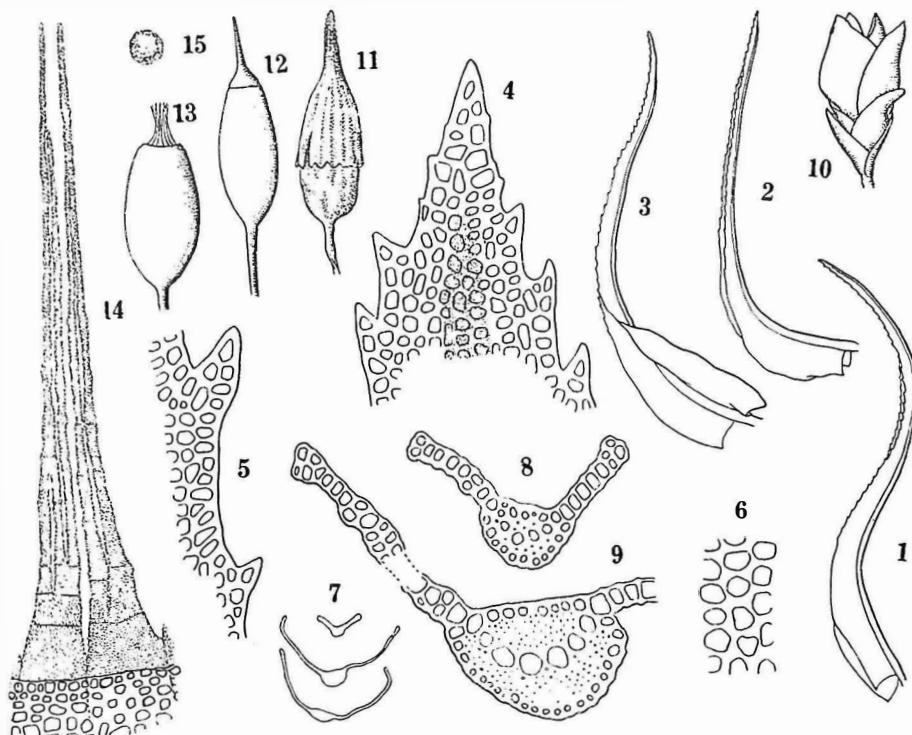


Fig. 13. *Pt. linearifolium* Reim.

1~3, leaves, $\times 11$. 4, leaf apex, $\times 283$. 5, mid margin of leaf, $\times 283$. 6, cells from middle of leaf, $\times 347$. 7, cross sections of leaf, $\times 33$. 8, 9, ditto (8 upper, 9 lower), $\times 200$. 10, male bud among stem leaves, $\times 31$. 11, capsule bearing calyptora (when dry), $\times 11$. 12, capsule, $\times 11$. 13, deoperculate capsule, $\times 11$. 14, peristome, $\times 140$. 15, spore, $\times 347$.

Specim. exam. Kyusyu. Kagoshima Pref.: Tasiro-mura, Hetuka (A. Noguchi, May 1933); Miyazaki Pref.: Sakatani-mura (A. Nog. Aug. 1946), -Mt. Osuzu (Y. Kuwahara, Aug. 1950), -Iwato-mura (H. Samezima, July 1931); Kumamoto Pref.: Issyōti-mura (K. Maebara, July 1947 & Dec. 1951), -Mt. Syakaindake (N. Takaki, Sept. 1946), -Simomasiki-gun, Toda~Nihonsugi (Y. Nishihara, May 1953), -Mt. Siraga (A. Nog. July 1931), -Mt. Yatake (A. Nog. Aug. 1931), -Yunoura-mura (H. Kaneda, Oct. 1935), -Yamanisi-mura (H. Takahashi, Mar. 1935), -Mt. Hukaba (N. Tak. Apr. 1934 & Oct. 1946), -Mt. Itihusa (K.

Maeb. Jan. 1936), -Watari-mura (K. Maeb. June 1937, as *Pt. dentatum* det. by Sakurai), -Somasaki (Sh. Okamura, July 1907, as *G. wilsoni* det. by Brotherus); Ōita Pref.: Nagoya-mura (M. Hadano, Aug. 1953), -Mori-mati (A. Nog. Oct. 1946), -Hukayabakei (A. Nog. Sept. 1943 & Nov. 1946), -Yuhuin-mati (A. Nog. Aug. 1943), -Mt. Nakamatonohata (A. Nog. Oct. 1952), -Mt. Daisen (A. Nog. Aug. 1947), -Mt. Katamuki (T. Hadano, ann. 1948), -Tenzinyama-mura (A. Nog. Nov. 1949), -Hita (A. Nog. Mar. 1942), -Beppu (A. Nog. Aug. 1939), -Mt. Yuhu (A. Nog. Oct. 1938), -Mt. Sobo, granite-porphyry (A. Nog. Nov. 1931 & Oct. 1952), -Hakusan-mura (S. Sato, Dec. 1948), -Obira, granite porphyry (S. Sato, Dec. 1953); Fukuoka Pref.: Mt. Hikosan (A. Nog. Aug. 1948), -Mt. Homan (A. Nog. Mar. 1933); Saga Pref.: a vicinity of Saga (M. Kurita, Feb. 1938); Nagasaki Pref.: Mt. Unzen (H. Sikata, Apr. 1950). **Sikoku.** Ehime Pref.: Mt. Omogo (S. Oti, Aug. 1931; A. Nog. Aug. 1935), -Mt. Isiduti (A. Nog. Aug. 1935), -Saidyō (K. Oti, Dec. 1952), -Mt. Saragamine (K. Oti, Apr. 1953); Kōchi Pref.: Mt. Hōnokawa (M. Kamimura, Dec. 1933 & Nov. 1935), -Mt. Wasio (Sh. Okam.), -Mt. Nonogawa (H. Wada, Feb. 1930), -Mt. Sōda (M. Kam. Oct. 1934), -Mt. Iradu (Sh. Okam. Jan. 1908, as *G. wilsoni* det. by Broth.), -Mt. Kuisi (Sh. Okam. Mar. 1903, as *G. wilsoni* det. by Broth.), -Syōwa-mura (H. Wada, Feb. 1936), -Mt. Siraga (K. Yamamoto, Aug. 1934), -Sinzyō-mura (M. Kam. ann. 1934), -Asō-mura (M. Kam. Dec. 1935), -Mt. Kokuzo (M. Kam. Oct. 1934), -Mt. Yokogura (Sh. Okam. Mar. 1904, as *G. wilsoni* det. by Broth.; M. Kam. Aug. 1934), -Mt. Yanaze (K. Yam. Nov. 1938); Tokushima Pref.: Mt. Turugi (S. Murai, Mar. 1932), -Mt. Tairyūzi (S. Murai, Mar. 1932). **Honsyu.** Hata-mura (S. Matumoto, May 1932), -Tyōmonkyō (S. Mat. Mar. 1932); Hiroshima Pref.: Sandankyo (A. Nog. June 1933), -Mt. Gokurakuji (A. Nog. Jan. 1927), -Mt. Madoyama (A. Nog. Oct. 1926), -Minoti-mura (A. Nog. Apr. 1928), -Mt. Aduma (A. Nog. July 1936); Okayama Pref.: Gōkei (Y. Ikegami, Oct. 1934), -Ukanisi-mura (T. Iki, May 1951); Tottori Pref.: Mt. Hanami (A. Nog. June 1931); Hyōgo Pref.: Sikagatubo (T. Nakahara, Nov. 1932), -Mt. Hunakosi (E. Tatebe, Aug. 1950 & Mar. 1951), -Tutagawa-mura (E. Tat. June 1949), -Tikusa-mura (E. Tat. May 1951), -Takeda-mati (E. Tat. June 1950), -Ruriikei (K. Yam. Jan. 1951), -Hōkidani (K. Yam. Nov. 1349); Ōsaka Pref.: Mt. Inunaki (T. Nakazima, June 1935 & Dec. 1952), -Kaizuka (T. Nak. Mar. 1952), -Mt. Katuragi (T. Nak. Mar. 1934 & Jan. 1954), -Nisinose-mura (T. Nak. Mar. 1953), -Kisiwada (T. Nak. Sept. 1952), -Mt. Iwawaki (T. Nak. May 1952); Nara Pref.: Mt. Murozī (N. Tak. Dec. 1948), -Mt. Misen (T. Nak. Aug. 1952); Kyōto Pref.: Kyōto (K. Yam. June 1935); Siga Pref.: Sakamoto-mura (K. Yam. Mar. 1931), -Mt. Ibuki (K. Murata, May 1931), -Mt. Hiei (Sh. Okam. as *G. wilsoni* det. by Broth.; K. Yam. Feb. 1933), -Komatu-mura (K. Yam. Feb. 1931), -Ōisi-mura (K. Yam. Feb. 1933), -Ōtu (K. Yam. Feb. 1933); Wakayama Pref.: Mizunodaisi (Y. Tutiga, May 1931), -Kamiakitu-mura (Y. Tut., M. Kurita, Dec. 1932), -Mt. Nati (Y. Tut. Nov. 1931; M. Kur. Dec. 1932; S. Mat. Mar. 1941; T. Nak. Nov. 1935), -Owase-Kinomoto (N. Tak. June 1951), -Sone-mura (Y. Tut. Mar. 1932), -Mt. Gomadan (T. Nak. Mar. 1936; M. Mizutani, Sept. 1949); Mie Pref.: Mt. Komono (K. Murata, Aug. 1924, Nov. 1930 & Apr. 1932), -Mt. Gozaisyo (M. Kur. Jan. 1933), -Mt. Nonobori (Y. Tut. May 1936), -Mt. Yunoyama (Y. Tut. July 1935), -Tu (Y. Tut. May 1935), -Mt. Keisoku (Y. Tut. Apr. 1932); Aichi Pref.: Mt. Hōraizi (K. Mur. Oct. 1930; N. Tak. Mar. 1947 & Aug. 1947), -Miyazaki-mura (N. Takaki, Aug. 1947), -Miwa-mura (N. Tak. May 1948), -Taguti-mati (N. Tak. Apr. 1950, Jan. 1950 & Oct. 1951), -Mt. Ryūtoyama (N. Tak. Mar. 1950), -Ônyudani (N. Tak. Nov. 1951), -Mt. Hongū (N. Tak. Aug. 1947), -Adera (N. Tak. Jan. 1949), -Komayama (N. Tak. July 1951), -Mt. Tyausu (N. Tak. June 1950), -Nanatsato-mura (N. Tak. Feb. 1949), -Sakauba (N. Tak. Nov. 1951); Sizuoka Pref.: Ōigawa, Sendudamu (N. Tak. July 1951), -Mt. Amagi (K. Sakurai, July 1934), -Zyōren Falls (N. Tak. May 1950), -Amagi Pass, about 800 m (N. Tak. May 1950; I. Nagano, Mar. 1953), -Atugawa (I. Nag. Mar. 1953); Kanagawa Pref.: Mt. Hakone (H. Takahashi, Apr. 1939);

Yamanashi Pref.: Aokigahara (M. Ôki, Aug. 1953); Nagano Pref.: Tatue-mura, a vicinity of Iida (K. Tanada, June 1953), -Mt. Asama (Sh. Okam. Apr. 1912, as *wilsoni* det. by Broth.); Saitama Pref.: Mitumine (N. Tak. Apr. 1948), -Titibu, Urayama-mura, about 800 m, on clay-slate (I. Nag. Aug. 1952), -Mt. Bukô, about 750 m, on limestone (I. Nag. May 1952 & June 1952), ibidem, ca 400 m, on hornstone (I. Nag. Aug. 1952), -Otaki-mura, on hornstone (I. Nag. Dec. 1950), -Nagadoro, on metamorphic rocks (I. Nag. Feb. 1953), -Arakawa-mura, on hornstone (I. Nag. Feb. 1953); Tokyo Pref.: Okutama (H. Tak. Feb. 1939); Gumma Pref.: Mt. Nabewari (K. Tunoda, Nov. 1910), -Kanaiyama, on limestone (I. Nag. Aug. 1952); Ibaraki Pref.: Mt. Hanazono (E. Ihsiba, Oct. 1929); Miyagi Pref.: Sendai (A. Nog. Oct. 1929), -Isl. Kinkwazan (E. Ihs. Apr. 1908; A. Nog. June 1929).

Range: seems to be confined to Japan.

The sporophytes of this species, especially the length of seta are very variable. In extreme cases it reaches 7 mm in the maximum length, and only almost 2 mm in the minimum. There are numerous gradations between these extremes.

Although the geographical distribution of this species is by no means thoroughly known, it seems to be the dominant representative of the genus in Japan. Ihsiba reports this species from Hokkaido, but the writer has been unable to obtain the plants from there.

Ptychomitrium longisetum Reim. et Sak. in Bot. Jahrb. **64**: 541 (1931); Sak. in Bot. Mag. Tokyo, **53**: 249, f. 3 (1939).

Syn. **Pt. kiusiuense** Sak. l. c. p. 250, f. 6 (1939); Tak. in Journ. Jap. Bot. **25**: 191 (1950) -syn. nov.

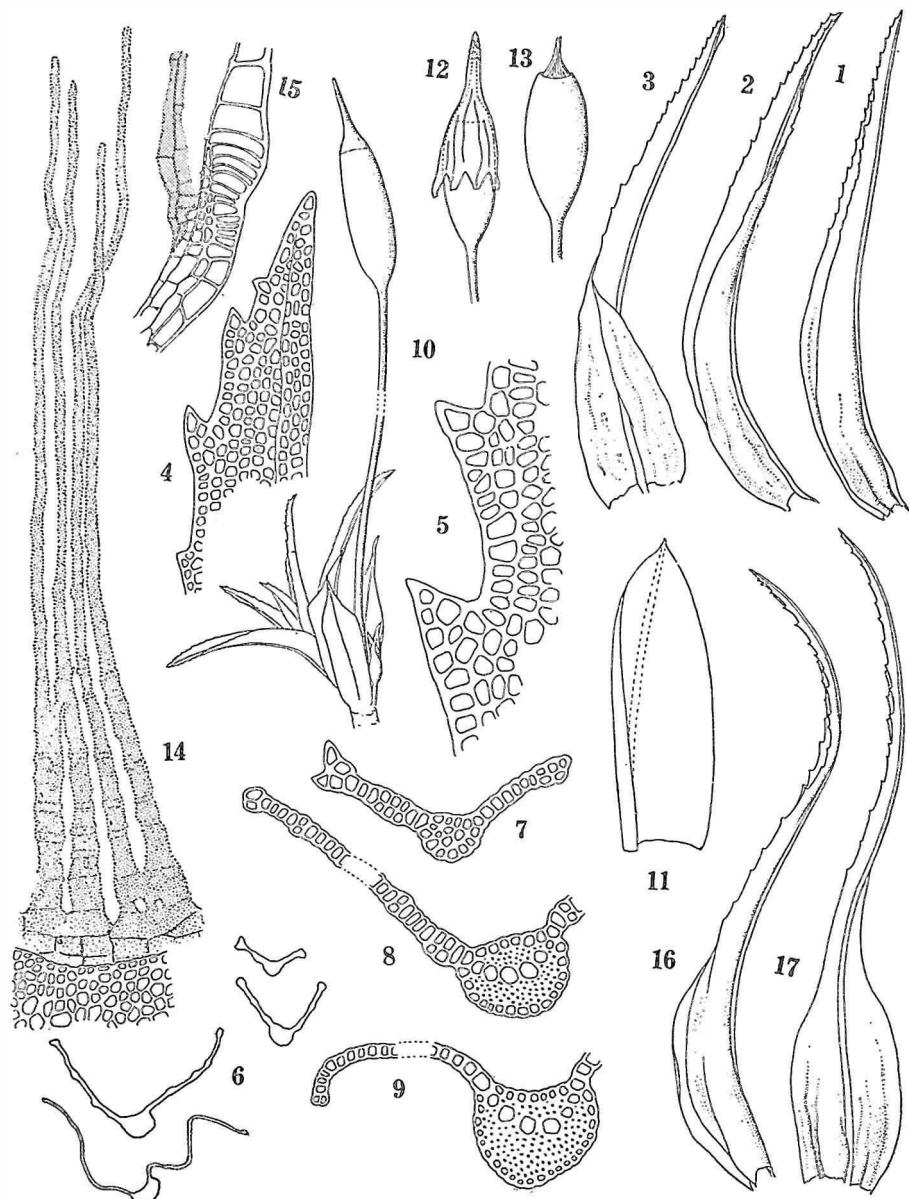
Pt. viride Sak. l. c. **54**: 7 (1940); Tak. l. c. -syn. nov.

Musci Japonici Exsiccati, ser. 7, n. 342 (1953)

(Figs. 4, 14)

Plants stout, dark green below, deep green above, forming roundish tufts. Stems aggregate usually dichotomously branched, reaching 5 cm long, densely leaved. Stem leaves incurved when dry, widely spreading or somewhat arcuate recurved, from a ovate-oblong base linear-lanceolate with acute apex, reaching 4.5 mm long, about 0.35 mm wide at base, lower deeply plicate, upper carinate-concave, margins largely and remotely toothed, lower slightly recurved and entire, costa stout 0.095 mm wide at base, reaching leaf apex, cells obscure, the median ones rounded quadrate or shortly rectangular or rounded hexagonal with incrassate walls 6~8.5~10 μ in diam., lower elongated, basal lax and hyaline, rectangular with thin walls, 30~50×10~15 μ . Perichaetial bracts differentiated, much shorter and wider than stem leaves. Seta solitary, rather stout, yellowish, 7~10~12 mm long, about 0.15 mm wide. Capsule erect, oblong-cylindric, yellowish brown, 1.5×0.7~1.8×0.8~2×0.85 mm. Annulus hardly differentiated. Peristome teeth from a linear-lanceolate base long subulate, bifid into two occasionally three divisions, reddish brown, minutely and densely papillose, reaching 0.7 mm long. Spores almost spherical, minutely papillose, 10~13 μ in diam. Operculum from a conical base long rostrate, about 1 mm long. Calyptra campanulate base lobate, sulcate, yellowish, upper brown and scabrous, 2~2.5 mm long, extending to the middle of capsule.

Specim. exam. **Kyusyu**. Kumamoto Pref.: Ôno-mura (K. Maebara, Dec. 1935 -type of *Pt. kiusiuense*), -Kônose-mura (K. Maeb. Jan. 1927, Sept. 1936 -type of *Pt. viride*; A.

Fig. 14. *Pt. longisetum* Reim. et Sak.

1~3, leaves, $\times 15$. 4, leaf apex, $\times 173$. 5, mid margin of leaf, $\times 327$. 6, cross sections of leaf, $\times 48$. 7~9, ditto (7 upper, 8 middle, 9 lower), $\times 173$, showing sporophyte, perichaetial bracts, male bud and innovation, $\times 11$. 11, perichaetial bract, $\times 31$. 12, capsule bearing calyptra, $\times 11$. 13, deoperculate capsule, $\times 11$. 14, peristome, $\times 173$. 15, showing the longitudinal section of peristome, $\times 173$. 16, 17, var. *angustifolium*, leaves, $\times 15$.

Noguchi, Aug. 1931, H. Kaneda, Jan. 1937), -Issyôti-mura (N. Takaki, Aug. 1946; K. Maeb. May 1951), -Mt. Syakain-dake (N. Tak. Sept. 1946); Ôita Pref.: Kawanobori-mura (A. Nog. Sept. 1939). **Sikoku.** Kôti Pref.: Mt. Sôda-yama (M. Kamimura, May 1935), -Mt. Wasio (Sh. Okamura, as *G. wilsoni* det. by Broth.) **Honsyu.** Yamaguti Pref.: Akiyosi-mura (A. Nog. Oct. 1928; S. Matumoto, Mar. 1932 & Apr. 1932); Hiroshima Pref.: Taisyaku-mura (A. Nog. June 1932); Okayama Pref.: Toyonaga-mura (T. Iki, Apr. 1952), -Kusama-mura (T. Iki, Aug. 1946), -Kanigô-mura (T. Iki, Mar. 1950); Mie Pref.: Mt. Hudiwara (K. Murata, Sept. 1930; T. Kodama, Mar. 1953); Gihu Pref.: Mt. Yôrô (K. Mur. June 1931; N. Tak. Nov. 1948); Aiti Pref.: Miyazaki-mura (N. Tak. Aug. 1947); Nagano Pref.: Ozika-mura (N. Tak. July 1949); Saitama Pref.: Titibu, Mt. Bukô, 300~1330 m (I. Nagano, Aug. 1952, Nov. 1952 & June 1953), -Ubukawa (K. Sakurai, Apr. 1921 -type).

All specimens above cited were obtained from exposed limestone.

Range: Confined to Japan.

The present species was originally based on the specimens collected on limestone in Titibu district. It is characterized by dendroid stems bearing rigid leaves, longer setae, and by the habit growing on exposed limestones. Both species, *Pt. kiusiuense* and *viride*, established by Sakurai as new species, are also confined to limestones. The writer has examined the type specimen of each species, together with that of *Pt. longisetum*, and found that they are evidently united to one and the same species. Indeed the characters emphasized by Sakurai are not suitable to separate those two species from *longisetum*. Thus the range of the present species is extended westwards to Kyusyu from central Japan. In 1939, Sakurai reported *Pt. polyphylloides* from Ise (Mie Pref.). *Pt. polyphylloides* ranges in China, and is the nearest to *longisetum* but usually bears shorter seta measuring about 5 mm long. As stated above, in the species of *Ptychomitrium*, the length of seta is strongly variable. Therefore, it is uncertain that these two species are specifically separated.

var. *angustifolium* Noguchi, var. nov. (Fig. 14-16, 17)

A typo differt: folia e basi oblonga raptim elongatum linearia sicca crispata.

Honsyu. Gumma Pref.: Mt. Kanaiyama, ca 1100 m, on limestone (I. Nagano, Aug. 1952).

Ptychomitrium formosicum Broth. et Yas. in Ann. Bryol. 1: 19 (1928); Sak. in Bot. Mag. Tokyo, 53: 249, f. 4 (1939).

(Figs. 2, 4, 15)

Plants slender, dark green. Stems aggregate, curved, usually simple, reaching 5 cm long, rather densely leaved. Leaves crispatate when dry, erect-spreading when moist, from a oblong and plicate base gradually long linear, with acute or acuminate apices, slightly arcuate reflex, upper carinate lower involute, reaching 5.5 mm long, margins largely toothed upper 1/3, teeth composed of several cells, lower half revolute and entire, costa reaching near leaf apex, about 0.1 mm wide at base, cells obscure, in the middle of leaf subquadrate or rounded quadrate with strongly thickened walls, 5.5~8 μ in diam. near leaf base rectangular with strongly thickened walls, 15~25 \times 3~5 μ , at the insertion rectangular with thin walls, 40~55 \times 10~15 μ . Male bud with few bracts, inner one widely ovate with delicate costa, cymbiform. Perichaetial bracts hardly differentiated. Seta reddish yellow, somewhat flexuose when dry, 10~15 mm long, about 0.15 mm wide. Capsule erect, oblong-cylindric

or narrowly cylindric, yellowish brown, $2 \times 0.6 \sim 2.5 \times 0.7$ mm. Annulus distinct, of two rows of large and elongate cells. Peristome teeth from a linear-lanceolate base long filiform, bifid to the base, reaching 1.2 mm long reddish brown, densely and minutely papillose. Spores spherical minutely papillose, $8 \sim 10 \mu$ in diam.

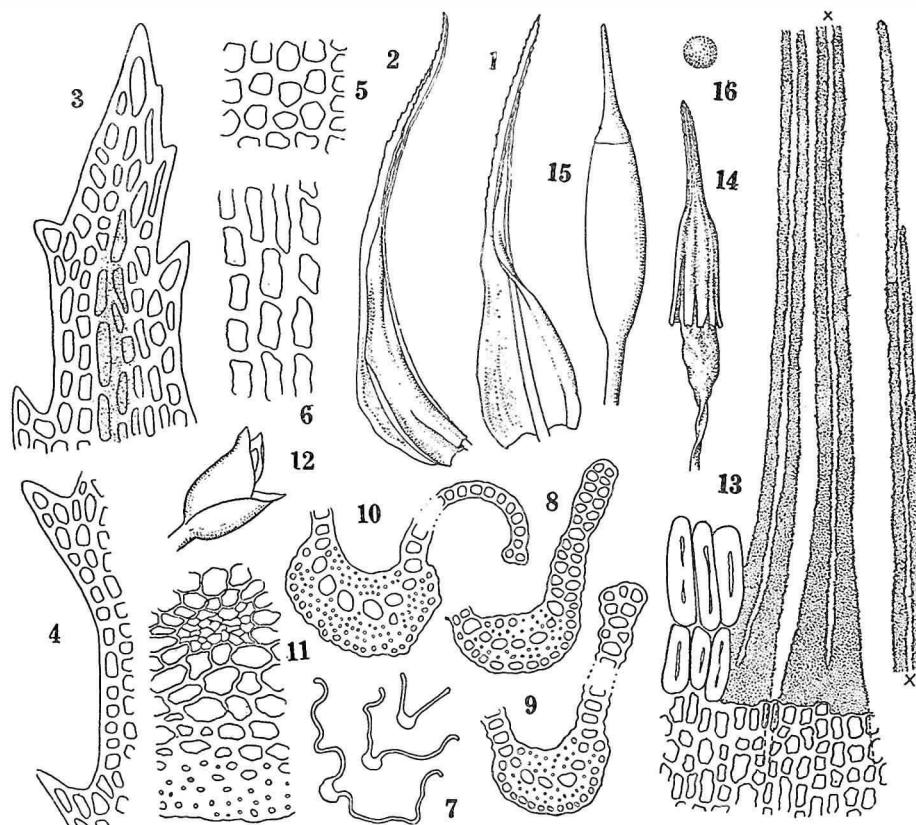


Fig. 15. *Pt. formosicum* Broth. et Yas.

1, 2, leaves, $\times 11$. 3, leaf apex, $\times 283$. 4, mid margin, $\times 283$. 5, cells from middle of leaf, $\times 347$. 6, cells from lower part of leaf, $\times 347$. 7, cross sections of leaf, $\times 33$. 8~10, ditto (8 upper, 9 middle, 10 lower), $\times 200$. 11, part of cross section of stem, $\times 200$. 12, male bud among stem leaves, $\times 23$. 13, peristome, $\times 200$. 14, capsule bearing calyptra (when dry), $\times 11$. 15, capsule, $\times 11$. 16, spore, $\times 347$.

Operculum long rostrate, nearly half the length of capsule, about 1.5 mm long. Calyptra campanulate, long rostrate, sulcate, deeply lobate, yellowish brown, upper brown and scabrous, about 2.8 mm long, extending below the middle of capsule.

Specim. exam. Formosa. Taityū County: Onoe (S. Suzuki, Nov. 1926 -type), -Mt. Morrison, Hattukan~the summit (A. Noguchi, Aug. 1932); Tainan County: Mt. Morrison, Tātaka~Niitakasita (A. Nog. Aug. 1932), -Niitakasita~the summit (A. Nog. Aug. 1932). Japan, Honshu. Nagano Pref.: Mt. Yatugatake (E. Iseiba, Aug. 1922).

Range: Confined to Formosa and Japan.

This species seems to be closely allied to European *Pt. polyphyllum*. In general appearance this species also is alike to *Pt. linearifolium*, but may be distinguished by the longer and narrower capsule bearing longer seta and finely subulate operculum. Furthermore, the presence of large annulus affords the former excellent differential character. It is also separable from *longisetum* by its narrower leaves which are crisped when dry, and moreover by the presence of distinct annulus.

In the lower region of leaf, the cell walls are strongly thickened for the genus, thus the features of areolation suggest a close relationship to *Rhacomitrium*.

正 誤 表 (Errata)

号 (No.)	頁 (Page)	行 (line)	誤 (For)	正 (Read)
9	48	下より 4	Mt. Ohgi	Mt. Ohuki
"	62	1~2	..truncate, margin mouth..	..margin truncate, mouth..
10	16	21	clemensii	clemensiae
"	22	13	"	"
"	70 (右)下より 15		tenuistipula	parvistipula

NOTULAE BRYOLOGICAE. V

A list of Mosses from Manchuria and North Korea

By Akira NOGUCHI

野口 彰： 蕨苔類小記（五） 満洲及び北鮮の蘚類

Concerning the mosses of Manchuria and North Korea, small reports have been published by E. S. Salmon (1900), V. F. Brotherus (1924, 25), H. N. Dixon (1934), Y. Horikawa (1953, 36), K. Sakurai (1941), A. Noguchi (1947, 50, 52), and others, but these publications give only an incomplete idea of the moss floras. The present article is mainly based on the materials collected in North Korea by T. Saito (1939, 40, 41) and in Manchuria by M. Takenouchi (1939, 41), supplemented by small collections made by M. Heki (1940) and K. Noguchi (1936).

I adopt the Japanese reading of the both Manchurian and Korean localities. The species preceded by an asterisk are new additions to the both floras.

The abbreviations are as follow:

Manchuria

D	Dorugu'arusyan, Kōanhokusyō (M. Takenouti, Feb. 1940)
DS	Dai'osyo-zan, Kantōsyū (K. Noguchi, 1936)
K	Kodōga, Kantōsyō (M. Tak. Sept. 1939)
N	Nidōkasi, Botankōsyō (M. Tak. Sept. 1939)
R	Rōyarei, Kiturinsyō (M. Tak. Aug. 1940)
SE	Senzan, Hōtensyō (M. Heki, Oct. 1940)
T	Tairei, Sankosyō (M. Tak. Sept. 1940)
TY	Northern slope of mt. Tyōhaku, about 2300 m alt. (M. Tak. June 1941)

North Korea

B	Bunsen, Kankyōnandō (T. Saito, 1939)
H	Hōtōri, Kankyōnandō (T. S. Apr. & Sept. 1940)
KW	Kwantōhō, Kankyōnandō (T. S. Aug. 1940)
O	Ōsawa, Kankyōhokudō (T. S. Apr. 1940)
RE	Reika, Kankyōnaddō (T. S. Apr. 1940)
S	Siroiwa, Kankyōhokudō (T. S. Apr. 1940)

Ditrichaceae

Ceratodon purpureus (Hedw.) Brid.	K	O	S
Range: Cosmopolitan			
* Distichium capillaceum (Hedw.) Br. eur.		O	
Range: Cosmopolitan			

Bryoxiphiaceae

Bryoxiphium savatieri (Husn.) Mitt.	H
Range: Japan	

Dicranaceae

- * **Oncophorus virens** (Sw.) Brid. O
Range: N.-Eur. Asia
- * **O. wahlenbergii** Brid. KW O
Range: N.-Eur. N.-E.-Asia
- * **Dicranodontium denudatum** (Brid.) Hag. K N S
Range: Eur. Cauc. Siberia, Japan, N.-Am.
- Orthodicranum flagellare** (Hedw.) Loesk. N
Range: Eur. Canary, Cauc. Sib. Jap.
- * **Dicranum japonicum** Mitt. K
Range: Jap.
- * **D. scoparium** (L.) Hedw. O H
Range: Eur. Asia, N.-Am.
- * **D. fuscescens** Turn. O
Range: Eur. Cauc. Sib. N.-Am.
- * **D. groenlandicum** Brid. TY
Range: N.-Eur. Sib. N.-Am.

Grimmiaceae

- * **Grimmia apocarpa** Hedw. N TY H
Range: Almost cosmopolitan
- * **G. ovalis** (Hedw.) Lindb. D TY
Range: Eur. Cauc. Himalaya, Ceylon, N.-E.-Asia, N.-Am.
- G. atroviridis** Card. H
Range: Confined to Korea
- * **G. pilifera** Palis. N
Range: E.-Asia, N.-Am.
- * **Rhacomitrium canescens** (Timm.) Brid. TY
Range: Eur. N.-Africa, Madeira, Cauc. Sikkim, Ceylon, Sib. Jap. N.-Am.
- * **Rh. lanuginosum** (Hedw.) Brid. TY
Range: Cosmopolitan
- * **Rh. sudeticum** (Funk.) Br. eur. TY
Range: Eur. Cauc. Jap. N.-Am.
- * **Ptychomitrium fauriei** Besch. B
Range: Jap.
- Pt. sinense** (Mitt.) Jaeg. DS H O
Range: Jap. China

Funariaceae

- Funaria hygrometrica** (L.) Sibth. K
Range: Cosmopolitan

Georgiaceae

- * **Georgia pellucida** (L.) Rabenh. O
Range: Eur. Cauc. Sib. Jap. Formosa, N.-Am.

Bryaceae

- * **Pohlia nutans** (Sch.) Lindb. KW S
 Range: Almost cosmopolitan
- Bryum argenteum** L. K H
 Range: Cosmopolitan
- * **Anomobryum filiforme** var. **juliforme** (Solms) Husn. TY
 Range: Eur.

Mniaceae

- * **Mnium arcuatum** Broth. H
 Range: Jap. Formosa, E.-China
- M. flagellare** Sull. et Lesq. K
 Range: Alaska, Aleutians, Amur, Saghalien, Jap. Korea
- M. marginatum** (Dicks.) Pal. de Beauv. O

This species is represented by a poor sterile specimen, accompanied by *Claopodium subpiliferum*. The leaf cells are smaller than those of America, measuring 18~22 μ in diam. in the middle of leaf. The collenchyma of the leaf cell is well marked. The leaves are widely oblong instead of oblong of American ones. But it may be affected by environmental condition.

- Range: Eur. Cauc. Himalaya, Sib. N.-Am.
- M. undulatum** (L.) Weis. K N
 Range: Widely distributed in the Northern hemisphere, excluding North America.
- * **M. cuspidatum** (L.) Leyss. S H
 Range: Eur. Cauc. Himalaya, N.-Asia, Amur, Jap. N.-Am.

Aulacomniaceae

- * **Aulacomnium palustre** (Hedw.) Schw. O H
 Range: Almost cosmopolitan
- A. turgidum** (Wahlenb.) Schw. TY
 Range: Eur. Sib. Jap. N.-Am.

Bartramiaceae

- * **Plagiopus oederi** (Gunn.) Limpr. H
 Range: Eur. Cauc. Himalaya, Amur, C.-Asia, Sib. Jap. N.-Am.
- * **Bartramia pomiformis** (L.) Hedw. D
 Range: Eur. Algeria, Cauc. Himalaya, Amur, Kamchatka, Jap. N.-Am. New Zealand

Orthotrichaceae

- * **Orthotrichum clathratum** Card. H O
 Range: Jap.

Fontinalaceae

- * **Fontinalis antipyretica** L. T
Range: Eur. Cauc. C.-N.-Asia, Jap.
- * **F. hypnoides** Hartm. TY
Range: Eur. Sib. Jap. N.-Am.

Climaciaceae

- Climacium japonicum** Lindb. N
Range: Jap. Korea, E.-China, Tibet
- Cl. dendroides** (L.) Web. et Mohr. K
Range: Widely ranging in the Northern hemisphere.

Hedwigiaceae

- * **Hedwigia albicans** var. **leucophaea** (Br. eur.) Limpr. D
Range: Eur. N.-Am.

Leucodontaceae

- Leucodontella perdependens** (Okam.) Nog. K N R
Range: Amur, Jap. (Hokkaido)
- Leucodon coreensis** Card. H
Range: Jap.

Neckeraceae

- Neckera pennata** (L.) Hedw. (syn. *N. abbreviata* Card.) K N R
Range: Widely distributed in the Northern hemisphere.
- * **Homalia trichomanoides** (Schreb.) Br. eur. H
Range: Eur. Cauc. Sib. Jap. E.-China

Leskeaceae

- * **Leskeella nervosa** (Schwaegr.) Loesk. TY
Range: Eur. Cauc. Kashmir, Panjab, Altai, Amur, Sib. N.-Am.

Thuidiaceae

- Claopodium subpiliferum** (Ldb. et Arn.) Broth. S H O
The substrata of the above specimens are not certain. On the substratum that this species occurs, H. Persson (Bryologist 50: 294, 1947) states "As to the Alaskan localities,—mostly is growing on rocks, obviously often in crevices." Several specimens from Japan are not the case. A specimen from mt. Daisetu, Hokkaido, in my herbarium occurs on logs and another one from Titibu district, central Japan, on limestone covered with humus at an elevation of about 1900 m.
Range: Sib. Ussuri, Jap.
- Abietinella abietina** (Dill. L.) C. Muell. D
Range: In the Northern hemisphere.

- * **Tetracladium molkenboerii** (Lac.) Broth. N
Range: Jap.

Amblystegiaceae

- Platyhypnidium rusciforme** (Neck.) Fleisch. S
Range: Widely ranging in the Northern hemisphere.
- * **Hygrohypnum dilatatum** (Wils.) Loesk. H
Range: Eur. Cauc. Kashmir, Sib. Jap. N.-Am.
- * **Hygroamblystegium irriguum** (Wils.) Loesk. TY
Range: Eur. Alger, Cauc. Altai, N.-Am.
- * **Drepanocladus uncinatus** (Hedw.) Warnst. H
Range: Widely ranged in the world.
- * **Campylium hispidulum** (Brid.) Mitt. S syn. *Heterocladium japonicum*
Sakuri in Journ. Jap. Bot. 19: 409, f. 10 (1943), syn. nov.
Range: Eur. Cauc. Sib. Amur, China, Jap. N.-Am.
var. **coreense** (Card.) Nog. Comb. nov. Syn. *Hypnum hispidulum* var.
coreense Card. in Beih. Bot. Cent. 17: 40 (1904) R
The costa of leaf is single and moderately long.
Range: Korea

Brachytheciaceae

- Brachythecium populeum** (Hedw.) Br. eur. H
Range: Eur. Cauc. Sib. Jap. N.-Am.
- * **B. buchanani** (Hook.) Jaeg. H
Range: Nepal, Himalaya, Bhutan, Assam, Jap.
- * **Eurhynchium striatum** (Hedw.) Sch. O
Range: Eur. Alger, Cauc, Small-Asia, Altai, Formosa
- * **E. serrulatum** (Hedw.) Kindb. H
The occurrence of this species in North Korea is a noteworthy extension of the geographical range. But, in the above specimen the areolation of leaves is smaller than that of the American. I have certain doubts on the above identification.
Range: N.-Am.
- Myuroclada concinna** (Wils.) Besch. S H (seta short, measuring about 7 mm long)
Range: Amur, China, Jap.

Entodontaceae

- * **Entodon attenuatus** Mitt. S
Range: Jap.
- * **E. cladorrhizans** (Hedw.) C. Muell. H
Range: N.-Am.
I refer this to the American species with some doubts.
- * **E. rostrifolius** C. Muell. S
Range: E.-China

Entodon ramulosus Mitt. N

Range: Jap. Korea, Formosa

* **Pterigynandrum filiforme** (Timm.) Hedw. O

Range: Eur. Alger, Canary, Sib. Jap. N.-Am.

Sematophyllaceae**Heterophyllum haldanianum** (Grev.) Kindb. H

Range: In the Northern hemisphere.

Hypnaceae* **Hypnum circinatum** Broth. H

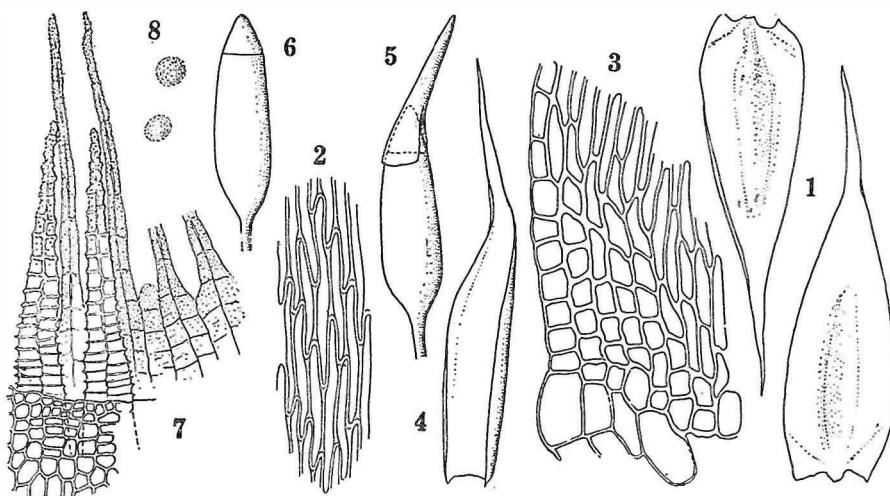
Range: Jap.

Pylaisia schimperi Card. O

Range: Sib. Altai, N.-Am. Mexico

Pylaisia coreana Noguchi, sp. nov. (Fig. 12)

Autoica. Planta corticola lutescenti-viridis, dense caespitosa. Caulis repens, subpinnatim ramosus, ramis erectis 3~5 mm longis, simplicibus vel parce ramulosis, dense foliosis. Folia sicca ± homomalla, madida erecto-patentia, ovato-oblonga

Fig. 12. *Pylaisia coreana* Nog.

1, leaves, $\times 48$. 2, cells from middle of leaf, $\times 327$. 3, basal angle of leaf, $\times 327$. 4, inner perichaetal bract, $\times 31$. 5, capsule bearing calyptra, $\times 15$. 6, capsule, $\times 15$. 7, peristome, $\times 173$. 8, spores, $\times 327$.

sensim lanceolatum attenuata, concava medio ± carinata, $1 \times 0.3 \sim 1.2 \times 0.35$ mm, costa nulla vel obsolete bina brevi, marginibus integris superne obsolete crenulatis, cellulis medianis linearibus parietibus tenuibus, angulis humile unipapillatis, $55 \sim 70 \times 4 \sim 5.5 \mu$ in diam. marginalibus aequalibus, apicalibus ± brevioribus parietibus

crassioribus, alaribus numerosis subquadratis 8~10 μ . Bracteae perichaetii internae alte vaginantes linear-lanceolatum attenuatae, involutae, ad 2 mm longae. Seta lutescenti-fusca, laevis, 7~12 mm longa, ca 0.12 mm crassa. Theca erecta, ovato-cylindrica, symmetrica, 1.7×0.45~2×0.55 mm, annulus indistinctus. Peristomium duplex, exostomii dentes linear-lanceolati, ca 0.25 mm longi, lutescentes, laeves sed superne indistincte papillosi, endostomii membrana alta, processus lineares carinati, minutissime papillosi, dentibus externis multo longiores, ca 0.33 mm longi. Sporae globosae, indistincte papillosae, 10~13 μ . Operculum conicum apice rotundato-obtusum, 0.3~0.4 mm altum. Calyptra cucullata longe rostrata, laevis, ca 1.5 mm longa.

Hab. N. Korea: Kankyo-nandō County, Hōtōri (T. Saito, May 26, 1940), type in Herb. Noguchi and in Hattori Bot. Lab.

The present species seems to be closely allied to *P. sublaevigata* Toyama from Hokkaidō, North Japan. But, it may be distinct in having longer processus and in lacking cilia of inner peristome and annulus.

Gollania neckerella var. **coreensis** (Card.) Broth. O H

Range: Confined to Korea

Rhytidaceae

* **Rhytidadelphus triquetrus** (L.) Warnst. K H

Range: Eur. Cauc. Himalaya, N.-E.-Asia, Saghaliens, N.-Am.

Rhytidium rugosum (Ehrh.) Kindb. D N

Range: Eur. Morocco, Cauc. Asia, N.-Am.

Hylocomiaceae

* **Pleurozium schreberi** (Willd.) Mitt. H

Range: Widely ranging in the Northern hemisphere.

Hylocomium proliferum (L.) Lindb. N

Range: Widely ranging in the Northern hemisphere.

Polytrichaceae

* **Atrichum undulatum** var. **hausknechtii** (Jur. et Mild.) Frye B

Range: Widely ranging in the Northern hemisphere.

Pogonatum urnigerum (L.) Palis (syn. *P. higoense* Sak. in Bot. Mag. Tokyo, 50: 373, 1936 -syn. nov.) R H

Range: Eur. Amer. Asia, Canary

* **Polytrichum juniperinum** Hedw. K O

Range: Almost cosmopolitan

* **P. sphaerothecium** (Besch.) Broth. TY

Range: Jap.

(to be continued)

MORPHOLOGY OF REBOULIACEAE. II
On some species of *Mannia* Corda, *Asterella* Beauv.
and *Plagiochasma* L. et L.

By P. KACHROO¹⁾

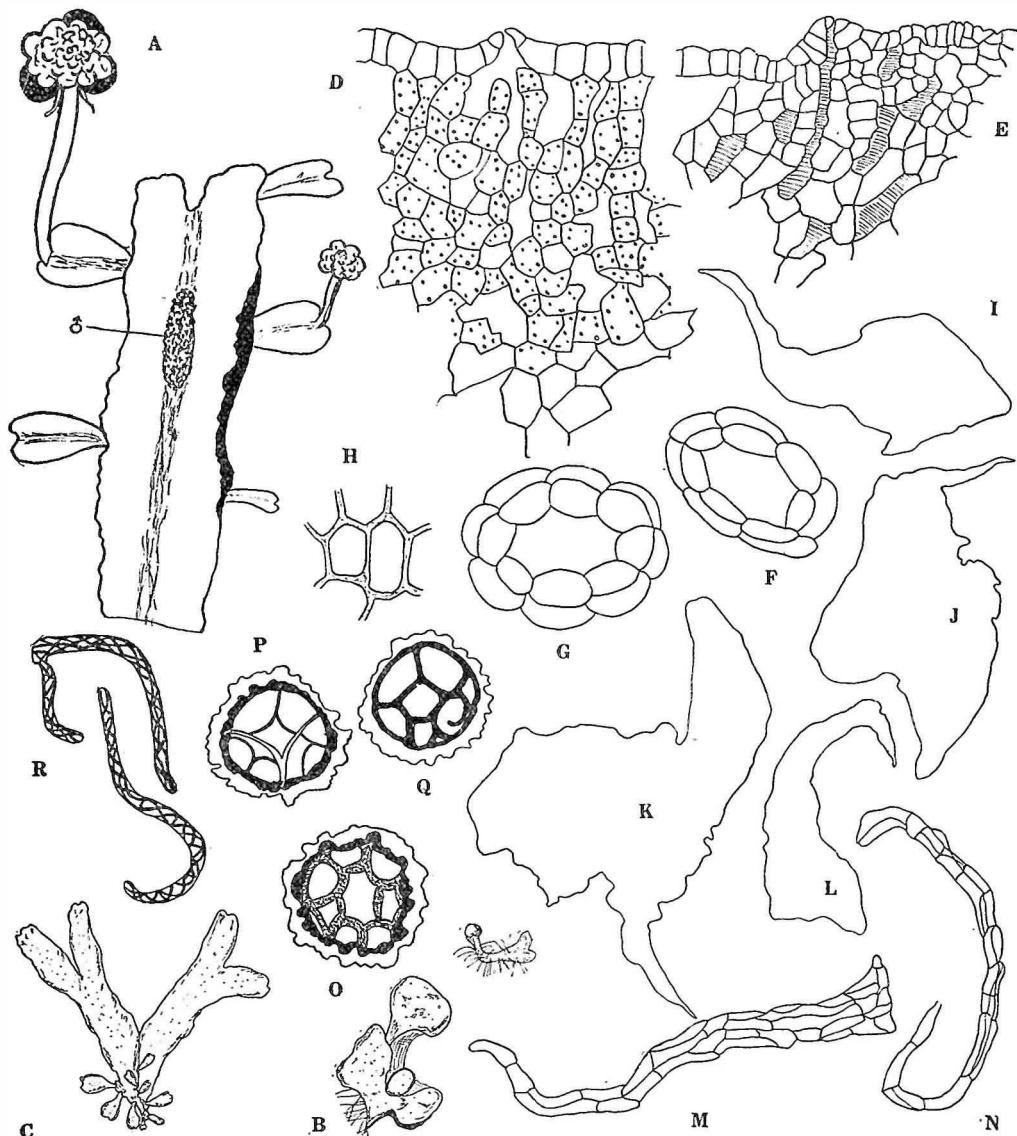
The individuality of the family Rebouliaceae (Operculatae) has been recognised by Leitgeb (1881), Cavers (1912), Schiffner (1893), Verdoorn (1932) and Evans (1939). Goebel (1905), Kashyap (1929), Buch (1936) and Frye & Clark (1937) merge it with their complex family Marchantiaceae. Leitgeb, Cavers, Campbell (1918), Schiffner and Frye & Clark arrange the family and its genera as an ascending series, whereas Geobel, Kashyap, Verdoorn and Evans arrange them as a descending series. Leitgeb (1881) included *Plagiochasma*, *Reboulia*, *Grimaldia*, *Neesiella* and *Fimbriaria* in his Operculatae. Cavers (1911) raised it to family rank, renaming it Aytoniaceae, with the genera: *Plagiochasma*, *Reboulia*, *Neesiella*, *Cryptomitrium*, *Grimaldia*, *Massalongoa* and *Fimbriaria*. Verdoorn recognised it as Operculatae, with the genera: *Asterella*, *Grimaldia*, *Massalongoa*, *Neesiella*, *Plagiochasma* and *Reboulia*. Evans (1939) renamed it Rebouliaceae, including genera: *Reboulia*, *Mannia*, *Asterella*, *Cryptomitrium*, *Massalongoa* and *Plagiochasma* under it. For convenience the latter classification is followed in this investigation.

Previous communications dealt with sporeling germination studies in *Reboulia*, *Mannia*, *Asterella* and *Plagiochasma* (Mehra & Kachroo, 1951) and the distribution of the family in India (Kachroo, 1954). The present study includes morphology of *Mannia indica*, *Asterella*, 5 spp., and *Plagiochasma appendiculatum*. A subsequent publication will include a detailed study of sex organs, sporogonium and interrelationships of the various genera and species.

***Mannia indica* St.**

Monoeious. The thallus is about 1.3 cm. long, 2.5–3.5 mm. broad, linear, often simpler, with a round or broken apex and with lateral shoots. It grows in patches on sandy soil usually in dry places when it is thicker and dark green; when growing in moist places they become longer and light green. They are always protected by grasses or ferns or both. Common associates are: *Riccia discolor* St., *Asterella pathankotensis* Kash. and a blue-green algae (probably *Nostoc*). The dorsal surface is flat or more or less concave; margin usually uneven, entire, purple or colourless. The epidermal cells, 4–5 angled with thick walls, trigones absent or inconspicuous. Assimilatory region densely chlorophyllous, air chambers in 3–5 layers in the midrib region, empty; opening to outside by simple pores, each bounded by two series of cells with 7–9 cells in each ring. Ventral surface is purple. Scales are purple, overlapping, not exceeding the margins, lunate or more or less triangular; appendages entire, purplish, lanceolate, straight or bent. The antheridial receptacle is a prominent elliptical or a linear-oblong cushion becoming purplish after the maturation

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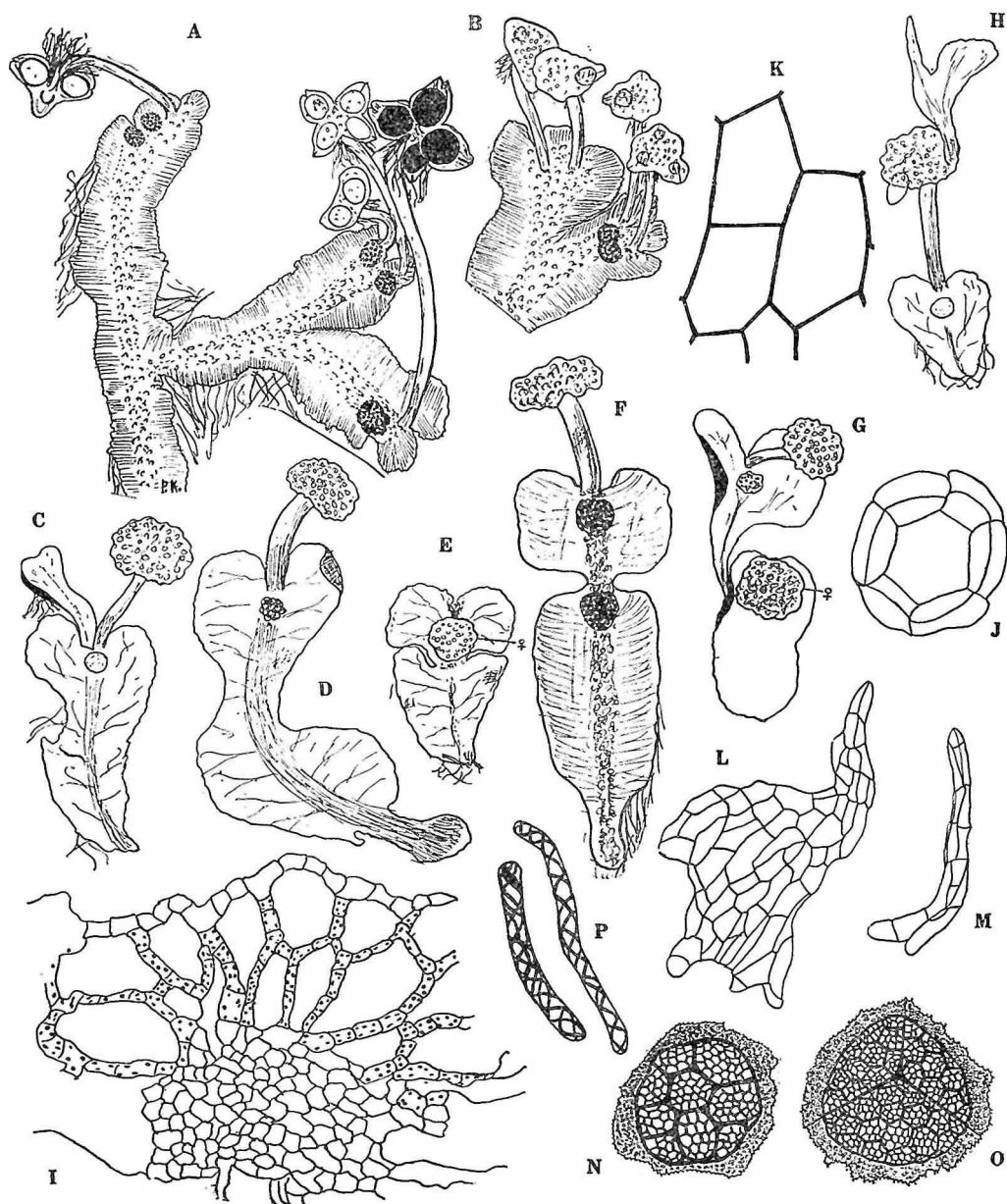
Text-fig. I. *Mannia indica* St. A, mature plant with female receptacle and male cushions, $\times 8$. B, ventral shoot with young female receptacle and vegetative shoot; the latter removed (b), $\times 2$. C, plant showing regeneration of shoots from basal injured region, $\times 4$. D, vertical section of thallus, $\times 325$. E, longitudinal section of the same, $\times 325$. F, pore of female receptacle. G, same of thallus, $\times 325$. H, epidermal cells, $\times 325$. I-K, scales from thallus; L, same along growing point, $\times 75$. M, N, scales from stalk of female receptacle, $\times 75$. O-Q, spores, $\times 325$. R, elaters, $\times 325$.

of spermatozoids; either situated in the mid dorsal line or just behind the apex. The antheridial papillae are purple and conspicuous. The female receptacle is stalked and borne apically on the ventral shoots, which are upto 9 on either side of the thallus. The pores are compound, bounded by 2-3 series with 6-8 cells in each. (All the ventral shoots are not sexual). Often the female receptacle becomes purplish as in *A. blumeana* and *A. reticulata*, probable due to the development of anthocyanin pigments in more xerophytic conditions. Rarely it harbours *Nostoc* in the air chambers and remains shortly stalked. The stalk is upto 3 cm. long and 0.5 mm. in diameter with a single rhizoidal furrow, bearing linear, lanceolate, entire and slightly purplish scales towards the apex. The receptacle is convex, involucres upto 4, capsules slightly exerted, operculum larger than in *Asterella*, brown, about a mm. in diameter and with peg-like projections on the inside, never thrown off but getting detached at maturation of capsule. (The stalk is often associated with a ventral shoot at its base. It is probable that both arise due to a vertical division in the apical cell). Spores: spherical, brown, exine with large thick pentagonal areas with corners elevated, fewer on inner face; perisporium thick, lobed. $67-87\mu$ in diameter. Elaters 2-3 spiral, $190-290\mu$ long.

On moist and dry rocks and soil, usually protected. Widely distributed in Western Himalayas upto 10,000 ft.; at Lahore, Amritsar, Pathankot, Delhousie, Kulu, Pangi, Lahul, Kyelang, Mussoorie, Hoshiarpur etc.

Asterella blumeana Nees.

Monoecious. The thallus is notched, thin, yellow-pale green in colour, with a prominent midrib and lateral 'striped' wings; about 3 cm. long and 1 cm. broad. Simple with an apical broader and a basal narrower region or once or twice dichotomously branched. Lobes linear, obcordate; margin, entire or irregular. The dorsal surface is flat or nearly shallow; epidermal cells are polygonal with thickened walls and indistinct trigones. The pores are large, bounded by 2 series, with 6 cells in each. The air chambers are in many layers and without assimilatory filaments. The ventral surface is purple, or light-green in plants growing in very moist places, and with a prominent convex midrib. Scales are few, distinct, purple, more prominent in older portions of the thallus; appendaged, each lanceolate, acute or acuminate, entire or rarely bearing few projecting cells on the margin. The male receptacle forms a prominent cushion just behind the stalk of the female receptacle. The stalk of the latter, with a single rhizoidal furrow, is 3-8 mm. long, 0.25-0.5 mm. in diameter, purple and usually thin and scaly near the apex; the paleae are long, linear and usually with purple apices. The receptacle is slightly convex, translucent, 1-4 lobed and with a hyaline oblong perianth. The pores are compound, bounded by 2-3 series with 6-8 cells in each. The lid gets detached or may be thrown off as a plate or in pieces. The cells of the capsule as in other species of the genus, are thinner except in the lid where they are thicker with conspicuous angular thickenings. Spores: dark brown, spherical, exine with smaller, thinner reticulations enclosed within larger thicker pentagonal areas (either predominating); perisporium compact with circular markings and a finely dentate margin. $70-80\mu$. Elaters: bispiral, rarely 3-spiral, short, stump-like, $90-110\mu$ long.



Text-fig. II. *Asterella blumeana* Nees. A, plant with female receptacle and male cushions, $\times 15$. B-H, plants showing diverse habit, B $\times 15$, C $\times 6$, D $\times 10$, E $\times 5$, F $\times 10$, G $\times 6$, H $\times 6$. I, vertical section thallus, $\times 75$. J, pore of thallus, $\times 325$. K, epidermal cells, $\times 325$. L, scale from thallus, $\times 8$. M, same from female receptacle, $\times 75$. N, O, spores, $\times 325$. P, elaters, $\times 200$.

While this is the normal habit of the plant, some forms showing interesting habit are:—Fig. II C represents a plant which a vegetative shoot has been formed exactly from where the stalk of the female receptacle arises. Fig. II D illustrates basal continuation of the thallus due to activity of basal meristems. Usually the thallus stops growth after formation of female receptacle but sometimes after the antheridial cushion is formed the thallus instead of forming the stalked female receptacle continues growth into an apical sector where later the terminal female receptacle develops. The male receptacle represents the short isthmus (midrib with vestigial wings) connecting the two regions of gametophyte; or in other similar cases apical segment develops the male and the female receptacles in the usual manner. In still other cases the antheridial cushion is aborted and instead the thallus develops a stalked female receptacle in the usual fashion and a lateral ventral shoot (arising from the midrib) fans out into a thallus forming the sex organs in the usual way. Rarely two adjoining male cushions form a coeno-cushion or may be aborted on a lobe; a vegetative shoot may develop on the receptacle in the place of one of the archegonia as in *A. sanguinaria* (also noted by Peisel, Botanisches Archiv 10: p. 434, who reports it from the stalk as well).

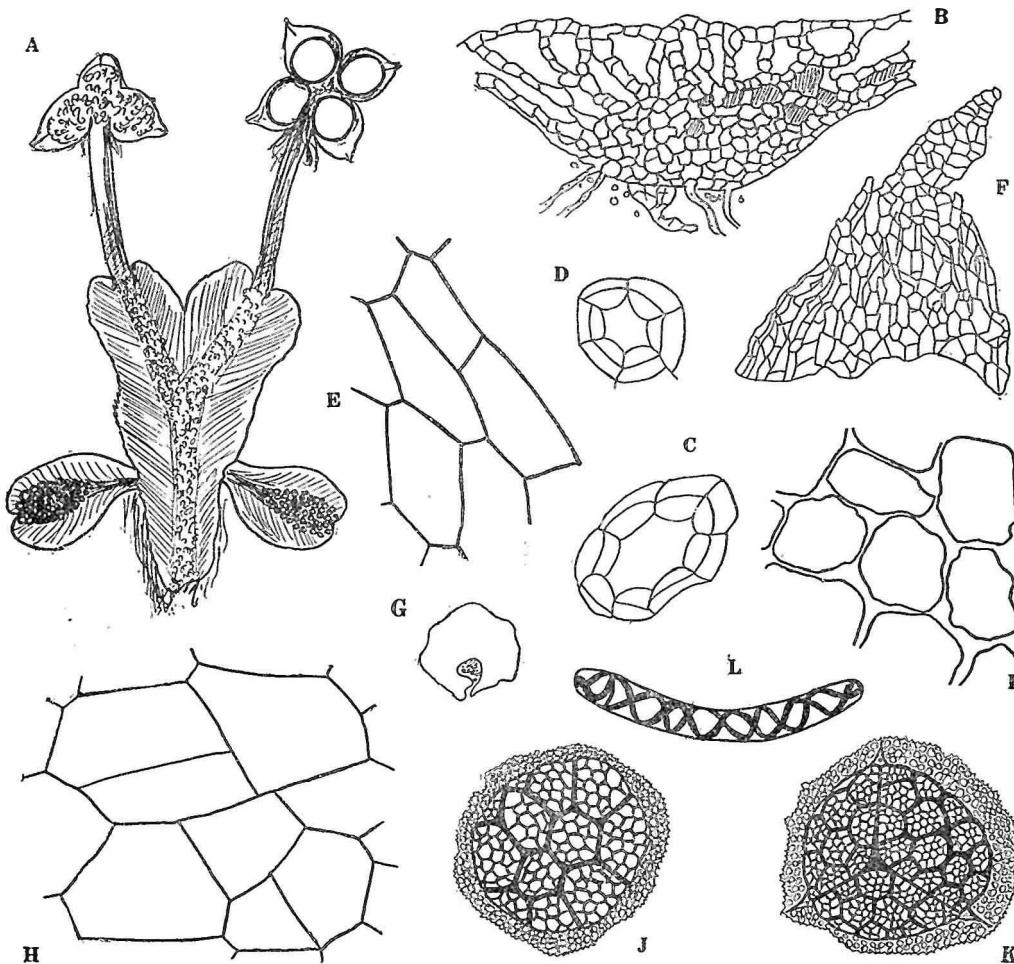
On rocks, moist shady slopes, on either side of exposed foot paths in Mussoorie and Khasi Hills. 4–7000 ft. Mussoorie, Simla, Nainital, Shillong, Jowai Road, Cherrapunji, Imphal.

Asterella reticulata Kash.

Occurs in loose patches or in a dispersed condition in shady places in association with *A. blumeana* and often *R. discolor*. Monoecious. The thalli are thin, semi-translucent, yellowish-green, with purple margins in the younger stages; once or twice dichotomously branched, upto 1 cm. long and 0.5 cm. broad; lobes ovate or obovate-oblong. Margin is entire, except for a few serrations here and there, purple or yellowish. Ventral shoots are borne either apically or on either side at the base and rarely at both the places. In the latter case the apical ones behave as vegetative shoots and the basal ones as male shoots or *vice versa*. The dorsal surface is flat with a prominent midrib. The epidermal cells are 4–6 angled, thin walled and without trigones. The pores are simple and comparatively less prominent. Air chambers in many layers and empty. The ventral surface is yellowish-green. Scales are either irregularly distributed or in alternate rows on either side of midrib, purple, ovate, delicate, appendaged and reaching the margins. Appendages ovate, lanceolate, acute and entire. Antheridial cushions are borne on the lateral ventral shoots. The stalked female receptacle terminates the main thallus. The stalk with a single rhizoidal furrow, upto 1.2 cm^l long and about 0.8 mm. in diameter, dark pink except for a short region near the apex where it is yellowish-pink. Receptacles flat, or insensibly convex with compound pores, with upto 4 involucres and with a hyaline perianth (becoming pink at maturity towards the apex). A lid resembling that in *A. blumeana* is present. Spores: brown, spherical, exine with thinner smaller reticulations enclosed within larger pentagonal areas; perisporium broad, firm with circular markings and a finely dentate margin. 70–90 μ . Elaters dark brown, 2-spiral, 200–250 μ long. (Rarely plants with intermediate habit between *A. blu-*

meana and *A. reticulata* are met with, these have male cushions both on the main thallus and on the ventral shoots towards the base).

Shady places and along the road sides or on cuttings. 8–10,000 ft. Kashmir, Lahul, Keylang, Mussoorie.

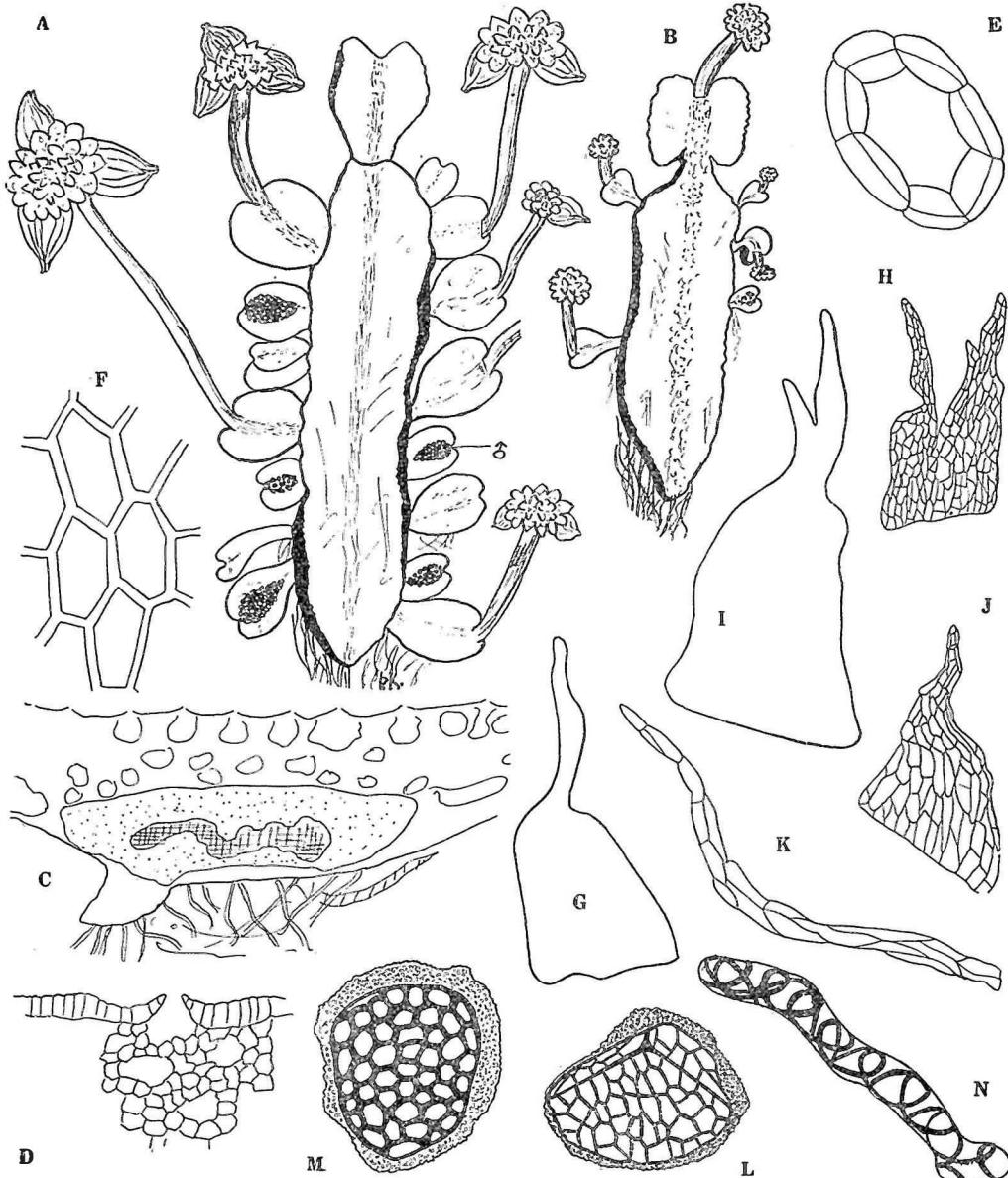


Text-fig. III. *Asterella reticulata* Kash. A, plant with female receptacles and male cushion, $\times 5$. B, v.s. thallus, $\times 75$. C, pore on thallus. D, same on female receptacle, $\times 325$. E, epidermal cells, $\times 300$. F, scale from thallus, $\times 45$. G, t.s. stalk female receptacle $\times 45$. H, cells from capsule wall. I, same from lid, $\times 325$. J, K, spores, $\times 325$. L, elaters, $\times 325$.

Asterella mussooriensis Kash.

Monoecious, occurring in closely creeping patches or in dispersed colonies under the protection of grasses and mosses, which often hide the thalli completely from

view, the female receptacles, in such cases arise above this cover to disperse the spores; usual associates are: *A. angusta* St., *R. discolor* St. They are green,



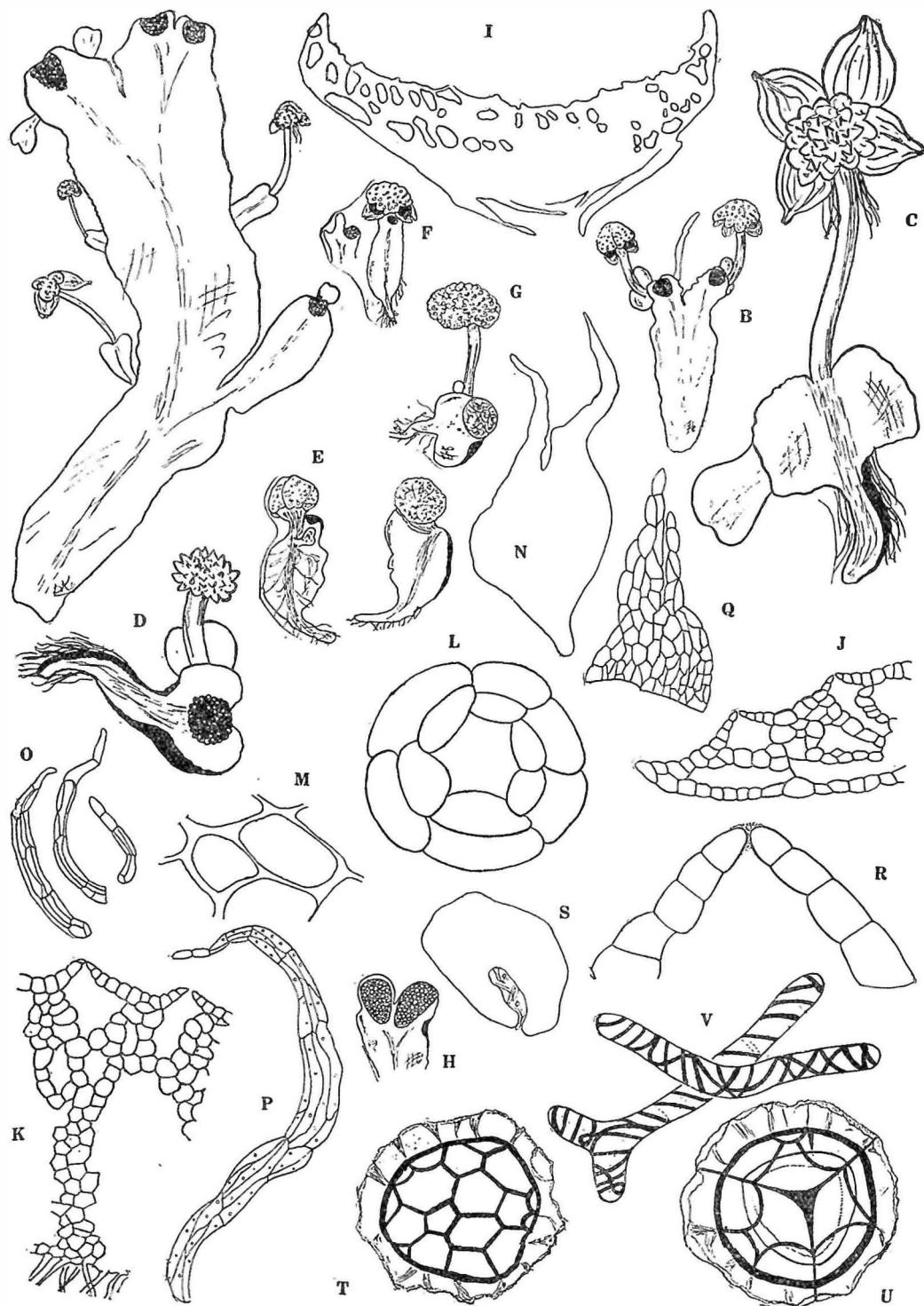
Text-fig. IV. *Asterella mussooriensis* Kash. A, B, plants with female receptacles and male cushions, $\times 8$. C, v.s. thallus, $\times 45$. D, same through a pore and air chambers, $\times 100$. E, pore of thallus, $\times 325$. F, epidermal cells, $\times 325$. G-J, scales from thallus, $\times 45$. K, same from female receptacle, $\times 45$. L, M, spores, $\times 325$. N, elater, $\times 325$.

linear, oblong, about 2 cm. long and upto 5 mm. broad, usually unbranched. The dorsal surface is shallow. The epidermal cells 4–6 angled, with walls and angles thickened. The pores are simple, bounded by 2–3 series with 6 cells in each. Air chambers in many layers and empty. Margin entire or irregular in older regions. The ventral surface is lightly convex, greenish or pinkish depending on the amount of moisture present in the substratum. Scales hyaline-pink, appendaged; appendages 1–2 per scale, linear, entire, pink or colourless. Ventral shoots about 4 mm. long and 2.5–3 mm. broad, borne laterally (rarely apically) on either side of the thallus, arising from the midrib, both sexual and vegetative. The antheridial cushion is oval growing along the midrib region towards apex of the vegetative shoot. The female receptacle is stalked. Both are borne apically on the vegetative shoots but the arrangement of sexual shoots is irregular: either male and female shoots alternate on either side of the thallus, or the male shoots are borne on one side and the female ones on the other side or they occur mixed up on either side with no definite arrangement. All the lateral shoots are seldom sexual, some of them are vegetative having an irregular arrangement with respect to the sexual shoots. Rarely the stalked female receptacle may be borne apically on the continuation of the main thallus which bears the male and the female shoots in the usual fashion. The stalk is with a single furrow, upto 10 mm. long, about 0.6 mm. in diameter, sparsely scaly at the apex and densely towards the base. The scales are long, linear and purple. The female receptacle is convex, occasionally flat, upto 4 lobed, with barrel shaped pores and conical-lanceolate perianth. Spore: spherical, brown, exine with smaller thinner reticulations; perisporium broad, finely punctate with indistinctly dentate margin. $70\text{--}99.5\mu$. Elaters: bispiral, upto 200μ , rarely branched.

Moist shady places, 5–7,000 ft. Mussoorie, Lahul and outer Himalayas.

Asterella sanguinia L. et L.

Monoecious, closely creeping or forming characteristic patches in which each thallus has its apex towards the periphery and its base towards the centre. Thallus once or twice forked, 1.5–2.5 cm. long, upto 6 mm. broad; lobes when present 8 mm.–1 cm. long and upto 4 mm. broad; always terminating in a male cushion (rarely receptacle). Margin pinkish brown and raised up. A pair of lateral shoots arising ventrally, bearing stalked female reseptacles arise near the apex, one on either side of the thallus. Occasionally the number of such shoots is more, thus recalling the habit in *A. pathankotensis* Kash. The dorsal surface is concave due to slight inrolling of the margins; epidermal cells are 5–6 angled with distinct trigones; pores are simple, raised up and bounded by 4–5 series with 6–8 cells in each; air chambers in many layers, longer than broad, the wings bearing air chambers except for dorsal and ventral epidermis and the intervening cell rows separating the chambers. The midrib is convex ventrally, 1/3 of the thallus breadth and gradually tapering towards the wings, ultimately one cell thick. Ventral surface is yellowish green, becoming pink in the older thalli. Scales, one row on each side of the midrib, overlapping, upto the margins, usually with 2 rarely 3 appendages; appendages pinkish, body colourless or yellowish-pink; scales under the male cushion are aggregated into small groups. The male cushion terminates the main thallus,



Text-fig. V

antheridial papillae, small but prominent. Often the cushion is raised up in form of a receptacle and bears a very short stalk like structure. The female receptacles are borne on the lateral ventral shoots. The latter are small, with a thick midrib and small wings, often the wings are vestigial and it appears that the stalk of the receptacle arises directly from the midrib just beneath the male cushion. The stalk is with a single furrow, upto 7 mm. long, 0.5 mm. in diameter, usually light green in colour, or pink at the base and scaly; scales are long, linear, colourless or pinkish. Receptacle is convex, with compound pores, 4 involucres—more often a solitary sporogonium matures—perianth hyaline, ovate and reflexed. The lid is thrown off at maturity. Spores: spherical, dark brown, exine with large pentagonal areas, sparse on the inner face; perisporium thick, broad, rough and overturned along the margin. $90-99\mu$. Elaters: bispiral, rarely trispiral or branched, $90 \times 12 - 75 \times 18\mu$.

While this is the general structure of the plant some interesting plants met with are: In about 10% cases in any colony the vegetative thalli are represented by a heart-shaped anterior region and a posterior tail. About 3/4ths of this anterior region is occupied by the antheridial receptacle and a stalked female receptacle is borne apically on a single ventral shoot. In some similar cases the male receptacle is subsessile and the ventral shoot vestigial. In another case the male cushion bifurcates along the two sides of the bifurcated apical notch, this might show that the male receptacle has two growing points which stop growth after sometime (cf. *Plagiochasma*). The apical cell of the thallus in such case may later form a vegetative shoot. Both the male cushion and the stalked female receptacle may be borne on the main plant. The male cushion is borne on the left side (in Fig. II, F) of the apical notch which is itself prolonged into a very short stalk bearing female receptacle—thus confirming that stalk is prolongation of the thallus. In a specimen the ventral shoot was as long as the plant itself (dwarf heart-shaped plant) and bore an adventitious shoot arising from near the base of the stalk.

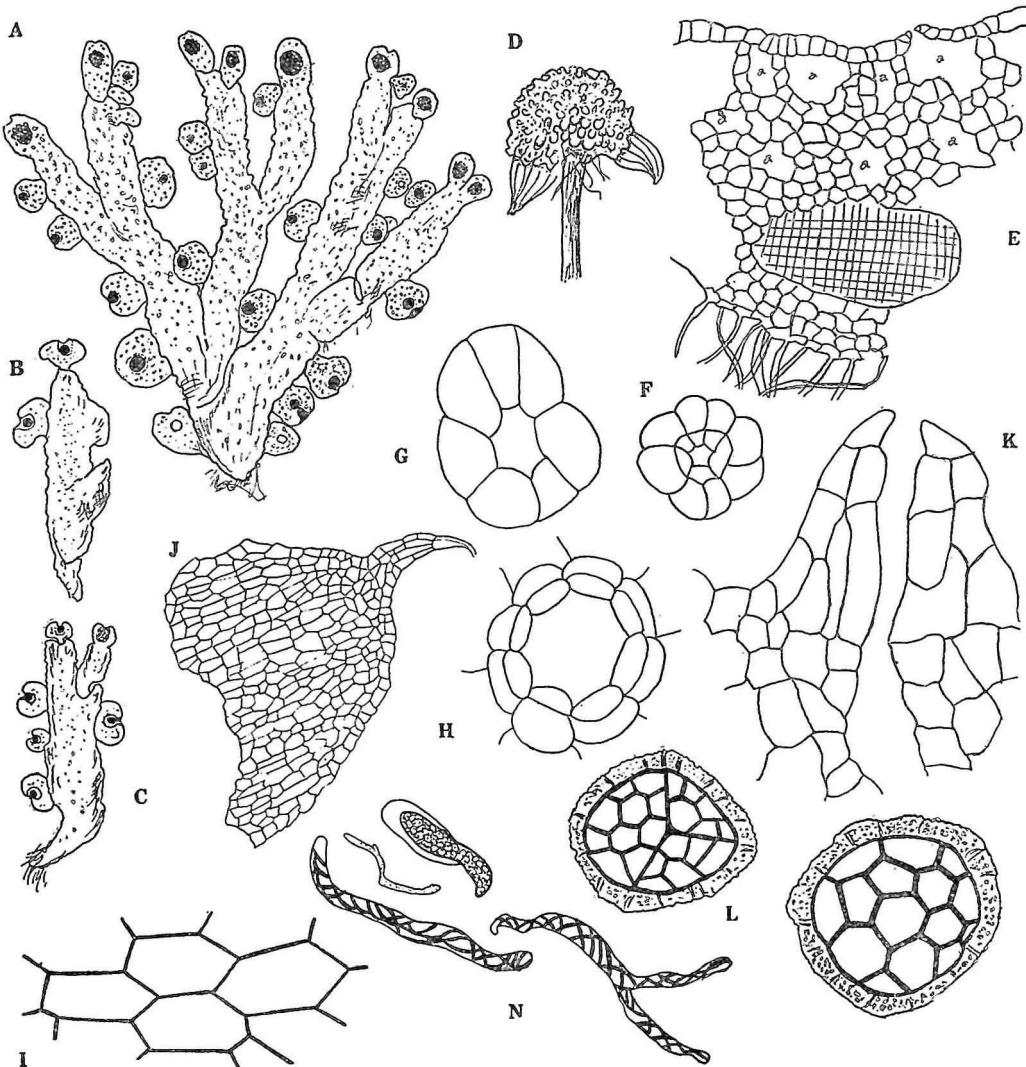
On exposed walls with scanty moisture or directly under strong intensity of light, rarely on moist soil. Nepal (Wallich), Simla (Griffith), Gauhati, Imphal.

Asterella pathankotensis Kash.

Monoecious, thalli in dense green patches, closely attached to substratum, usually accompanied by *Riccia discolor*, *Mannia indica*, *A. mussooriensis* and *Plagiochasma appendiculatum*, once or twice dichotomously branched, 2.5–3 cm long, upto 0.5 mm. broad; lobes linear or linear-oblong, 1.5 cm. long, 0.5 mm. broad; and with a variable number of ventral shoots arising from the midrib on either side of the thallus, each upto 7×3 mm. Dorsal surface is slightly concave or flat; margin wavy, purple

Text-fig. V. *Asterella sanguinia* L. et L. A, B, plants with female receptacles and male cushions, $\times 5$. C-H, plants with diverse habit; C, D, $\times 6$, E-H, $\times 2$. I, v.s. thallus, $\times 75$. J, l.s. through wing and K, through midrib of thallus, $\times 75$. L, pore of thallus, $\times 325$. M, epidermal cells, $\times 325$. N, scale from thallus, $\times 45$. O, P, same from female receptacle, $\times 45$. Q, same from under the male cushion, $\times 45$. R, v.s. through male papilla, $\times 75$. S, t.s. stalk, $\times 45$. T, U, spores, $\times 325$. V, elaters, $\times 325$.

in old thalli; pores simple, bounded by 3 series of cells with 5-6 cells in each; epidermal cells 5-6 angled, walls and angles not thickened; air chambers small, in many layers and empty. The midrib is convex ventrally and gradually passes into the wings; ventral surface purple or light-green. Scales are purple, one row on either side of the midrib, overlapping, appendaged; appendages small, linear or acute.



Text-fig. VI. *Asterella pathankotensis* Kash. A-C, plants with young female receptacles and male cushions, $\times 2\frac{1}{2}$. D, female receptacle, $\times 6\frac{1}{2}$. E, v.s. thallus, $\times 75$. F, G, pores of thallus, $\times 325$. H, pore from female receptacle, $\times 325$. I, epidermal cells, $\times 300$. J, scale from thallus, $\times 45$. K, v.s. antheridial papilla, $\times 75$. L, M, spores, $\times 325$. N, elaters, $\times 325$.

The male cushion is just behind the growing point; antheridial papillae prominent, small and becoming purple in mature conditions, their conical tips are mucilaginous and bring about opening when the spermatozoids are released by the antheridium. The female receptacle is stalked, borne apically on the ventral shoots, rarely such shoots are apical as well. A number of shoots are vegetative. Stalk is with a single rhizoidal furrow, upto 1 cm. long, 0.5 mm. in diameter. Receptacle is convex, with 1-4 involucres, barrel-shaped pores, perianth conical-ovate, hyaline or pinkish-red; capsule with a distinct lid. Spores: brown, exine with broad reticulations; perisporium finely punctate. 80-100 μ . Elaters: 1-2 spiral, rarely branched, 90-180 μ .

On dry slopes, exposed or protected; banks of ponds and other moist places, on cuttings. Pathankot, Lahore, Dehradun, Hoshiarpur.

Plagiochasma appendiculatum L. et L.

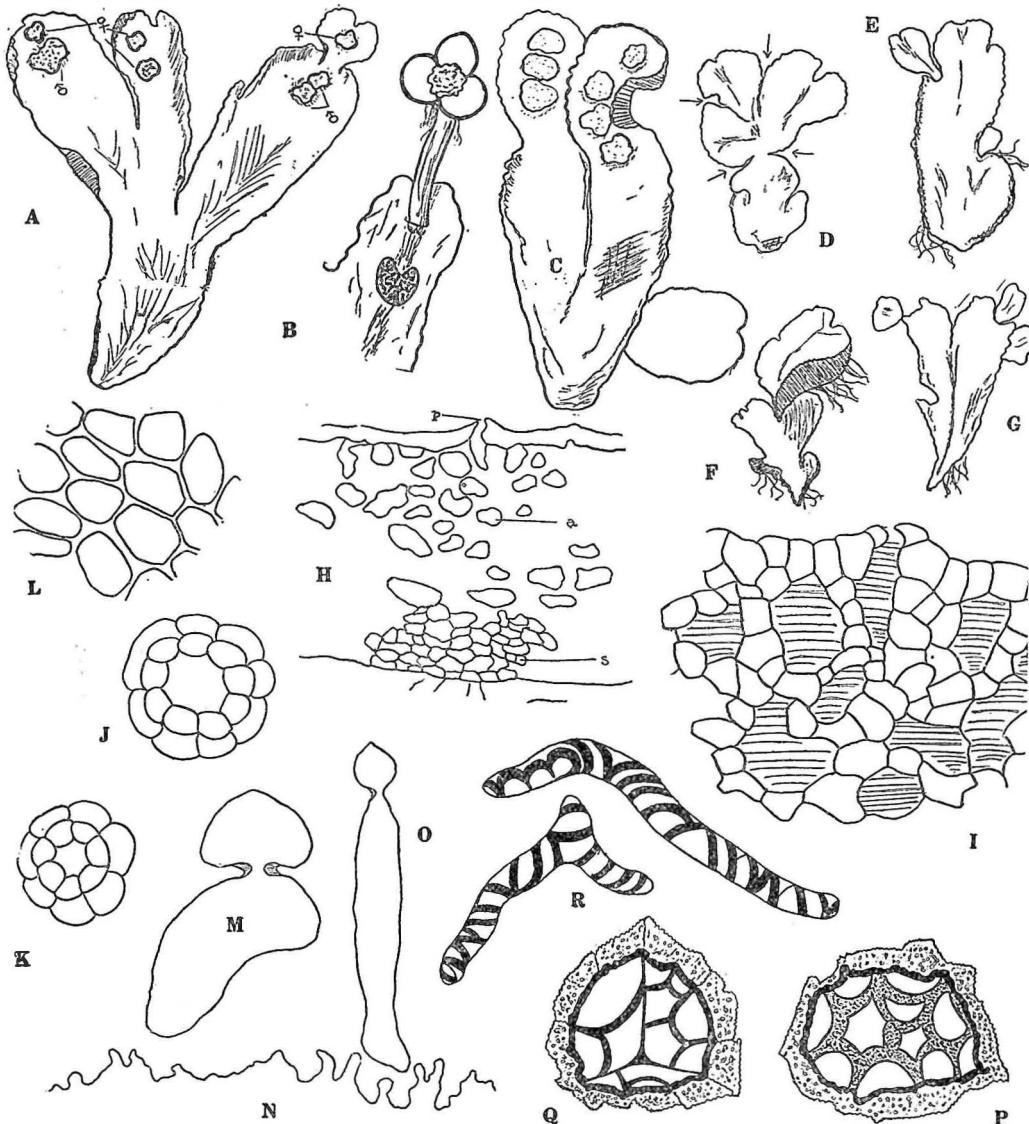
Monoecious. Thalli occur in large patches; broadly lobed, sometimes extending to several feet (Kashyap, 1929), usually 1-4 cm. long and upto a cm. broad dichotomously divided and occasionally forming adventitious shoots for vegetative propagation. The lobes are long obcordate. Dorsal surface smooth; epidermal cells 5-6 angled, with walls and angles highly thickened; pores simple, large, bounded by 2-3 rings with 6-10 cells in each and often with radial walls thickened; air chambers in many layers. Ventral surface purple or light-green with a row of scales on either side of the midrib. Scales broadly lunate, 1-2 appendaged, reaching 1/2 way to margin and over the apex; appendages, large, usually hyaline, entire, round, ovate or obtuse, occasionally purple, lanceolate or acute. The male receptacle is 1-2 times branched, either horse-shoe shaped or lobed, antheridia develop acropetally in each lobe; pores on the receptacle simple, protected by overlapping scales forming a perichaetum, and having the same origin as those of the ventral scales. Female receptacle usually sessile, occasionally shortly stalked, with upto 9 lobes; capsule with a definite lid. Scales of the receptacle long lanceolate with a triangular appendage. Spore: spherical, light brown, exine with larger thicker pentagonal areas; perisporium broad, more or less crumpled, finely punctate and serrate. 70-90 μ . Elaters: 2-3 spiral, 220-290 μ or 150-200 μ .

Habit varied, usually on rocks, moist shady places, exposed cuttings, along muddy drains etc., from plains upto 9,000 ft. Lahore, Rawalpindi, Saharanpur, Hoshiarpur, Delhousie, Jammu, Patni Pass, Simla, Mussoorie, Naintital, Nilgiris, Gauhati, Shillong, Dibrugarh, Imphal.

Air chambers

Evans (1918) recognises three types of air chambers in Marchantiales represented by the genera: *Marchantia*, *Reboulia* and *Riccia*. The present species fall under *Reboulia* type which includes *Ricciella*, *Ricciocarpus*, *Peltolepis*, *Sauteria*, *Clevea*, *Plagiochasma*, *Reboulia*, *Grimaldia*, *Neesiella*, *Cryptomitrium*, *Asterella* and *Bucegia*. In these genera the air chambers are in one or more layers, at least in the midrib region, in the form of irregular polyhedrons often tending to be isodiametric

and sometimes having assimilatory filaments in the air chambers which are in one layer.



Text-fig. VII. *Plagiochasma appendiculatum* L. et L. A-C, plants with female and male receptacles, $\times 4$. D-G, plants showing formation of adventitious shoots for propagation, $\times 2$. H, v.s. thallus, α -air chamber, p-pore, s-storage region, $\times 75$. I, same through pore and air chamber, $\times 125$. J, pore of thallus. K, same on female receptacle, $\times 325$. L, epidermal cells, $\times 325$. M, scale of thallus, $\times 45$. N, margin of the same, $\times 75$. O, scale from female receptacle, $\times 45$. P, Q, spores, $\times 325$. R, elaters, $\times 325$.

In *Asterella* the air chambers are in one or several layers, the former with or without assimilatory filaments and in the latter empty. In *A. blumeana* and *A. reticulata* the air chambers are loosely placed, large, polyhedral, 2-3 layered above the conspicuous midrib and about the same number or less in the wings. In the margins there is just a dorsal and a ventral epidermis separated by large air spaces. The chambers are separated by single layered chlorophyllous compartments. In *A. mussooriensis* and *A. sanguinia* and *A. pathankotensis* they are small, in many layers and separated by 2 - many layered compartments and the tissue is more compact than in the former species. In *Mannia* the air chambers are well developed. Stephani (1898),²⁾ Massalongo (1916)²⁾ and Kashyap (1929) report the presence of assimilatory filaments within the chambers and Müller (1906-11)²⁾ reports the presence of vertical plates of cells in addition as well. Schiffner (1908)²⁾ could not observe actual assimilatory filaments and Evans (1918) made a comprehensive study of the same in *M. fragrans* and noted the lack of such filaments. My observations on *M. indica* are in close accord with that of Evans. *Plagiochasma* is also characterised by narrow empty chambers laid in several layers. They are more compact and densely chlorophyllous.

The dorsal air chambers open to outside through simple pores. The inner chambers communicate with the dorsal ones and others through passages formed by the incomplete partition walls. These passages are narrow to check the transpiration which is necessitated by their xerophyllous habit. The cell walls of the pores are usually thickened and possess wax plugs to prevent surface becoming wetted. The barrel shaped pores on the female receptacle have extra protection against transpiration to ensure safe fertilization and development of the embryo. The pores on the male receptacle are however simple.

The development of air chambers in Marchantiales has been reviewed by Barnes and Land (1907) who describe their formation due to splitting of cell walls in the compact tissue below the surface of the young thallus. At maturity these open to outside by pores. Leitgeb (1881) ascribes their formation to cessation of upward growth in certain limited areas and by surrounding areas growing upwards vigorously. Evans (1918) gives a review of the then recent papers on the topic, namely those of Horsch (1910), Deutsch (1912), Black (1912) and O'Keefe (1915). He gave his own interpretation with respect to *M. fragrans* where air chambers are formed by splitting of cell walls in closely united tissue and split starts either inwards or outwards. The increase in size is due to the growth of the surrounding cells and only slightly to further splitting of the cell walls. In *Plagiochasma* (Barnes & Land, 1907; Starr, 1916; Mahabale & Deshpande, 1947) and in *A. angusta* (Mahabale & Bhate, 1945) the development is schizogenous. Mehra & Kachroo (1951) describe the development of air chambers from the sporeling stages in the various genera and establish it as schizogenous, the splitting being either inwards or outwards and the increase in the size of the chambers due to increased growth of the surrounding tissue. Further splitting of the chambers is not improbable and may be caused in the lower chambers.

2) vide Evans (1918).

Perennation, vegetative propagation and regeneration

All species are perennial and *P. appendiculatum* when ever growing under or near moisture in protected places, remains active throughout the year forming a chain of male receptacles, the archegonia are however formed only in the actual growing season. Other species perennate the unfavourable periods by rolling up their thallus and the dark pink ventral scales covering the ventral surface give the thallus a peculiar appearance. Rain or addition of moisture brings out expansion and activity. This hygroscopic action is brought out by cells which lack chlorophyll. In case of *A. mussooriensis* or *A. reticulata* the apex of the plant bends down in the soil at the end of the growing season and grows up again next year thus producing a characteristic band (Kashyap, 1929). Each perennating thallus expands and forms 1 or more apical shoots while the older portion gradually dies off. The formation of such apical shoots is of the following types: developed from the apex due to activation of apical cell; from the margins due to wound stimulus; from the midrib ventrally or from the two corners of the characteristic bend. *Cryptomitrium himalayense* form apical tubers at each apex of the lobe.

It is long known that nearly every cell of the vegetative body in liverworts and mosses can give rise to a new plant but experimental studies on regeneration in Hepaticas are very few. Swingle mentions a few references in this direction, notably that of *Metzgeria*. Vochting (1865) studied regeneration in *Marchantia* and found that vegetative shoots were produced only along the sides towards the vegetative point of the uninjured plant but in older thalli occasionally these appeared at the base as well. The base of the cut off gonophores as well as the walls of the gemmae cups formed the adventitious shoots. He referred it to the limited and unlimited growth of the organs concerned. But Goebel (1900) refers it to the movement of the plastic material or in the wound stimulus. According to him polarity does not appear at all, at least to the extent as in *Marchantia*, in other thalloid liverworts. The observations recorded here are in accord with Goebel's views.

Experimental studies in *A. pathankotensis* Kash. and *M. indica* St. conducted with a view to determine the factors responsible for the development of sporogonia on the ventral shoots incidentally revealed the extent of regeneration in these species. Thus when the thalli cut into a few transverse pieces were grown it was observed that the apical portion formed a dichotomous vegetative shoot, the middle portion marginal vegetative shoots and the basal a marginal and rarely an antero-marginal shoot, but never was there formed a shoot from the basal region. When the thalli were cut longitudinally along the midrib each half behaved more or less in the same manner. The apical male bearing portions were later separated and grown. Each portion formed a single or rarely two, vegetative shoots in continuation of the thallus due to activation of the apical meristem. The other two halves behaved thus: vegetative shoots were developed from the ventral shoots where archegonial receptacles had not made their appearance; and some ventral shoots, otherwise sexual, behaved as vegetative shoots. A vegetative shoot was developed from the midrib of one of the halves.

Continuation of the apical region beyond the male cushion was almost universal in all the segmented and unsegmented portions. This is, however, also the case in nearly all species but characteristic in *A. pathankotensis*, *A. mussooriensis* and *P. appendiculatum*. Uncommonly the prolonged thallus later dichotomizes; when each of the branches was cut and grown they developed into a normal thallus.

One of the plants in culture got somehow injured towards the base and a bunch of adventitious shoots developed from wherever the thallus was injured. On growing these shoots separately normal thalli were formed.

A. sanguinea kept in dormant conditions in absolutely dry atmosphere for about ten months rejuvenated and behaved as normal thallus when grown again in favourable conditions. Goebel (1900) reports *M. dichotoma* rejuvenating after seven years.

Apical cell

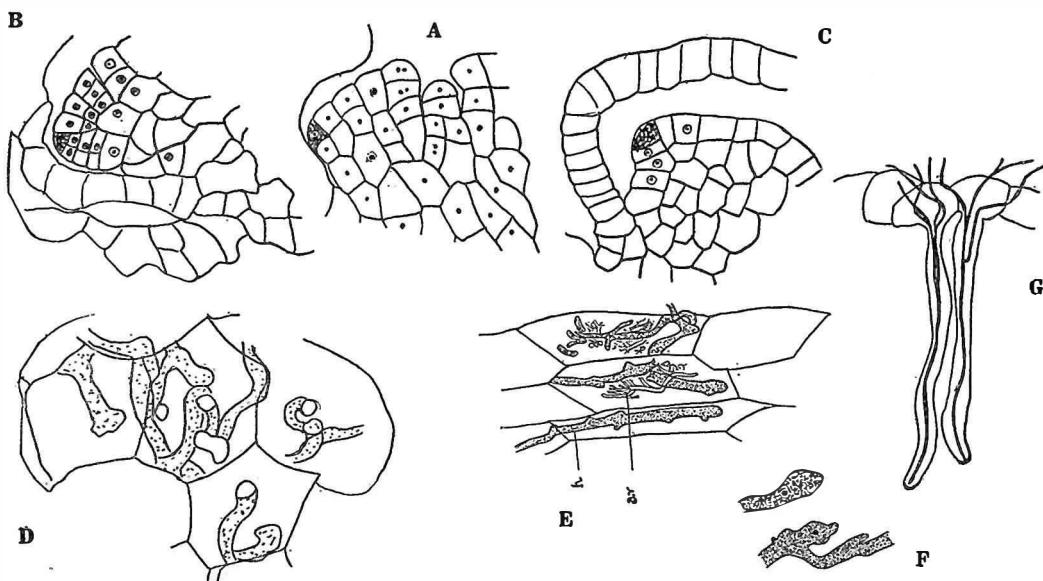
The thallus in all species grows by means of a single wedge shaped apical cell which lies in—the notch protected by scales—the latter are linear and smaller than those on the thallus. It cuts off segments on all sides, those formed on the ventral side form scales and are actively dividing while those formed on the dorsal side form reproductive organs or the vegetative shoots. The development of later formed ventral shoots indicate the presence of an intercalary meristem—in such cases it is not certain whether a single or many cells are concerned in their formation. The presence of a similar apical cell is reported for several other Rebouliaceae (Mahabale & Deshpande, 1947; Mahabale & Bhate, 1945; Haupt, 1920; Campbell, 1918 etc.). The apical cell is not used up in the formation of the sex organs. When either of the sex organs terminate the thallus it remains dormant till the maturation of the sex organs. Later it might put forth a vegetative shoot in the next growing season or even in the same season if the conditions are favourable. On the sexual ventral shoots it is more often abortive after the sexual organs are formed, but rarely buds off an adventitious shoot. Its activity is, therefore, conditioned by both physiological and environmental factors.

Mycorrhiza

Golenkin (1902)³⁾ observed mycorrhizic hyphae in *Plagiochasma elongatum* and Haupt (1920) observed these only in the ventral surface of thalli of *Reboulia hemispherica*. Chaudhuri and Rajaram (1926)³⁾ gave a detailed account of the same in some species of Marchantiales from India. Mahabale & Bhate (1945) observed inter and intra-cellular septate hyphae in storage tissue in older thalli of *A. angusta* while Mahabale & Deshpande (1947) report them as aseptic and intracellular in *P. articulatum*. In the species under consideration such hyphae are universally present in the storage tissue on the older thalli, mostly in the midrib region. Since the hyphae enter through the rhizoids, arising from the midrib, and since it is the region of conduction and storage there preponderance here is obvious.

3) vide Nicolas (1932).

The hyphae pass through the rhizoid as single or double threads and ramify in many branches on entering the lower epidermis. Later it becomes inter and intra-cellular. They are septate, with dense contents and have knob-like regions which are often binucleate and highly granular. In *Marchantia polymorpha* such hyphae are also present in the male receptacles but in Rebouliaceae it could not be detected beyond the vegetative thallus.



Text-fig. VIII. A-D, apical cell in *Mannia*, *Asterella* and *Plagiochasma* respectively, $\times 400$. D, inter- and intracellular mycorrhizic hyphae in the cells of the storage region, $\times 750$. E, same, h-hyphae, α -areoles, $\times 325$. F, hyphae, $\times 750$. G, hyphae in the rhizoid in lower epidermis, $\times 75$.

It could not be detected which exact fungus attacks the thalli but it is established that its presence is not prerequisite for the normal growth of the thallus (See Mehra & Kachroo, 1951). Divergent views have, however, been put forth with respect to their association with thalli. Bolleter, Nemese, Garganne, Peklo, Ridler and Theodore (vide Nicolas, 1932) consider their association as parasitic while Beauveries, Golenkin, Cavers, Nicolas, Magrou, Chaudhuri & Rajaram (vide Nicolas, 1932) consider this association very much as a symbiosis but the moment thalli die due to their weakness allow their reproductive organs to be engulfed by the hyphae they are parasitized. On the whole it may be said that the fungus is not injurious to the growth of thallus even in the case of latter's disintegration. During the propagation experiments on *Mannia* and *Asterella* vegetative shoots were produced from the decaying regions before these regions were attacked by a fungus. The death was due to causes other than the fungus attack. The nature of the thallus is such that it is more liable to be killed by physiological debility rather than by fungal infection. The relationship is one sided since the thallus does not

get any benefit from this association.

In *Mannia* besides, *Nostoc* colonies are quite common being found in their air chambers, often some cells of the ventral tissue and usually in the air chambers of the female receptacles. It is probable they fix atmospheric nitrogen for the thalli.

Rhizoids

These arises from the superficial cells of the lower epidermis with dense granular contents. The cells project from the surface and become elongated without undergoing cell division. Two types of rhizoids—simple and tuberculated—found exhibit division of labour in that the smooth ones serve for fixations and tuberculate ones for capillary conduction of solutes. The smooth ones also provide a channel for the mycorrhizic hyphae. Segregation of the two types is studied in the various species and it agrees with *Reboulia*, *Lunularia* and *Marchantia* in broader details (Mc Conaka, 1941) but disagrees with that of *Riccia* where these are dispersed and intermixed. The smooth ones emerge beneath the free margins of the scales and also from the midrib while the tuberculate ones arise laterally and form parallel strands to the thallus beneath each scale. The former have stiff contact with the substratum and latter form a capillary system. The tubercles are pectic in nature.

The following table gives a comparison of rhizoid, diameter, ratio of scale surface to thallus surface of some species included here.

Species	Average width in mm.	Thallus ratio to smooth & tuberculate surface	No. of rhizoids per cm. thallus length	Length rhizoids in mm.	Diameter rhizoids in μ
<i>Reboulia hemispherica</i>	6-7	0.75-1:1	t. 650 s. 1150	3.0 4.0	17.0 20.5
<i>Mannia indica</i>	5-6(-7)	1.75:1	t. 700 s. 1200	3-5.0 8-10.0	16.5 18.75
<i>Asterella mus-sooriensis</i>	5-6	1.5:1	t. 475 s. 800	12.0 15.0	19.0 17-18.5
<i>A. pathankotensis</i>	5	2.1:1	t. 380 s. 600	8.0 4-7.5	15.5-19.0 17.5
<i>A. sanguinia</i>	4-6.5	1.5:1	t. 560 s. 900	2-5.0 6-10.5	16.0 18-21.0
<i>Plagiochasma appendiculatum</i>	8-12	1.0:1	t. 529 s. 1,000	2.75 4.0	17.0 19.0

t.=tuberculate; s.=smooth.

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MARCHANTIALES OF JAPAN. III

By Daiske SHIMIZU and Sinske HATTORI

清水大典, 服部新佐: 日本のゼニゴケ類 (其三)*

7. *Athalamia* Falconer in Trans. Linn. Soc. London, **20**: 397, Pl. 19 (1851); Kashyap in New Phytologist, **14**: 10-14, Fig. 6 (1915); Liverw. W. Himalayas & Panjab Pl., Pt. 1: 85 (1929).

Cleva Lindb. in Not. Saellsk. Fauna et Fl. Fenn. **9**: 289 (1868); K. Müll. in Rebenh., Krypt.-Fl., Bd. 6, Aufl. 2, Abt. 1: 239 (1907) & Aufl. 3, Lief. **3**: 370 (1952); Frye & Clark, Hepat. of N. America, Pt. 1: 50 (1937), syn. nov.

Gollaniella Steph. in Hedwigia, **64**: 74 (1905); Kashyap in New Phytologist, **14**: 14-18, Fig. 7 (1915).

Kashyap (1929) regarded the genus *Gollaniella* as identical with *Athalamia*, and hence closely related to *Cleva*. Recently the authors (1953) noted, "We see no very good reason for generic division between *Athalamia* and *Cleva*", and considered both genera together with *Gollaniella* to be very closely related to each other. Falconer's original description of *Athalamia* was rather imperfect. Kashyap (1915) published its morphology in detail. He stated that *Athalamia pinguis* Falconer (1851), the genotype, has slit-like air chambers of one layer in the thallus. However, such air chambers also are observed in the thallus of most species of *Cleva*, although these are restricted near to the sexual organs and often not so narrow (see, Text-fig. X, T, XII, D & Q). The authors examined the air chamber of them and found that the slit-like air chamber is not proper to *Athalamia pinguis*.

Whether the pores of thallus are stellate or not should not be considered as a characteristic of generic value. Sometimes we can observe both types of the pore in the same plant; (1) cells around the pore with thickened radial walls, and (2) those with thin radial walls (see, Text-fig. X, F-H, XII, F-H). Thus *Athalamia*, *Cleva* and *Gollaniella* are better to be united into one and the same genus, the authors do not find any other characters of generic rank. Among the three genera the earliest is *Athalamia*.

The following is an enumeration of species described under those genera:

1) *Athalamia pinguis* Falc. in Trans. Linn. Soc. London, **20**: 397, Pl. 19 (1851); Kashyap in New Phytologist, **14**: 10, Fig. 6 (1915); Liverw. W. Himalayas & Panjab Pl., Pt. 1: 85, Pl. 18, 7-13 (1929). Syn. *Cleva gollani* Lev.; Steph., Spec. Hepat. **6**: 5 (1917). Genotype! Hab. Himalayas, India.

2) *Athalamia dioica* Kashyap in Journ. Bombay Nat. Hist. Soc. **24**: 348 (1916); Liverw. W. Himalayas & Panjab Pl., Pt. 1: 87 (1929). Hab. India. Kashyap (1929) notes that this is doubtfully distinct from *A. pinguis*.

3) *Athalamia pusilla* (Steph.) Kashyap, Liverw. W. Himalayas & Panjab Pl., Pt. 1: 87, Pl. 18, 1-6 (1929). Syn. *Gollaniella pusilla* Steph. in Hedwigia, **64**: 74 (1905); Kashyap in New Phytologist, **14**: 14, Fig. 7 (1915). Hab. Himalayas,

* 文部省補助金に負う。

India. Genotype of *Gollaniella*!

4) *Athalamia hyalina* (Sommerf.) Hatt., comb. nov. *Marchantia cruciata* var. *hyalina* Sommerf., Suppl. Fl. Lapp., 77 (1826). -*Cleva hyalina* Lindb. in Not. Saellsk. Fauna Fl. Fenn. 9: 291 (1868); K. Müll. in Rabenh., Krypt.-Fl., Bd. 6, Aufl. 3, Lief. 3: 372, Fig. 74-75 (1952); Schuster in Amer. Midland Naturalist, 49: 616, Pl. 82 (1953). -*Plagiochasma erythrosperum* Sull. (1869). -*Sauteria limbata* Aust. (1869). -*Fimbriaria nana* Lindenb. (1829). -*Grimaldia punicea* Wallr. (1840). Genotype of *Cleva*! Range: Europe, N. America, Greenland (Holarctic).

4a) *Athalamia hyalina* var. *suecica* (Lindb.) Hatt., comb. nov. *Sauteria suecica* Lindb. (1866). -*Sauteria seriata* Lindb. (1866). -*Cleva hyalina* var. *suecica* K. Müll. in Rabenh., Krypt.-Fl., Bd. 6, Aufl. 2, Abt. 1: 241 (1907) & Aufl. 3, Lief. 3: 373 (1952). Hab. Europe.

5) *Athalamia spathysii* (Lindenb.) Hatt., comb. nov. *Marchantia spathysii* Lindenb., Syn. Hep. Eur., 104 (1829). -*Plagiochasma rousselianum* Mont. (1838). -*Cleva spathysii* K. Müll. in Hedwigia, 79: 75 (1940); in Rabenh., Krypt.-Fl., Bd. 6, Aufl. 3, Lief. 3: 374, Fig. 76 (1952). Range: Mediterranean to Canary Ins., Palestina and N. Africa.

6) *Athalamia andica* (Spr.) Hatt., comb. nov. *Cleva andica* Spr.; Steph., Spec. Hepat. 1: 68 (1898). Hab. Andes, S. America.

7) *Athalamia pulcherrima* (Steph.) Hatt., comb. nov. *Cleva pulcherrima* Steph. in Engl. Bot. Jahrb. 20: 303; Spec. Hepat. 1: 69 (1898). Hab. Abyssinia, Africa.

8) *Athalamia robusta* (Steph.) Hatt., comb. nov. *Cleva robusta* Steph., Spec. Hepat. 1: 69 (1898). Hab. Chile.

9) *Athalamia chinensis* (Steph.) Hatt., comb. nov. *Cleva chinensis* Steph., Spec. Hepat. 6: 4 (1917). Hab. China (Giraldi leg.)

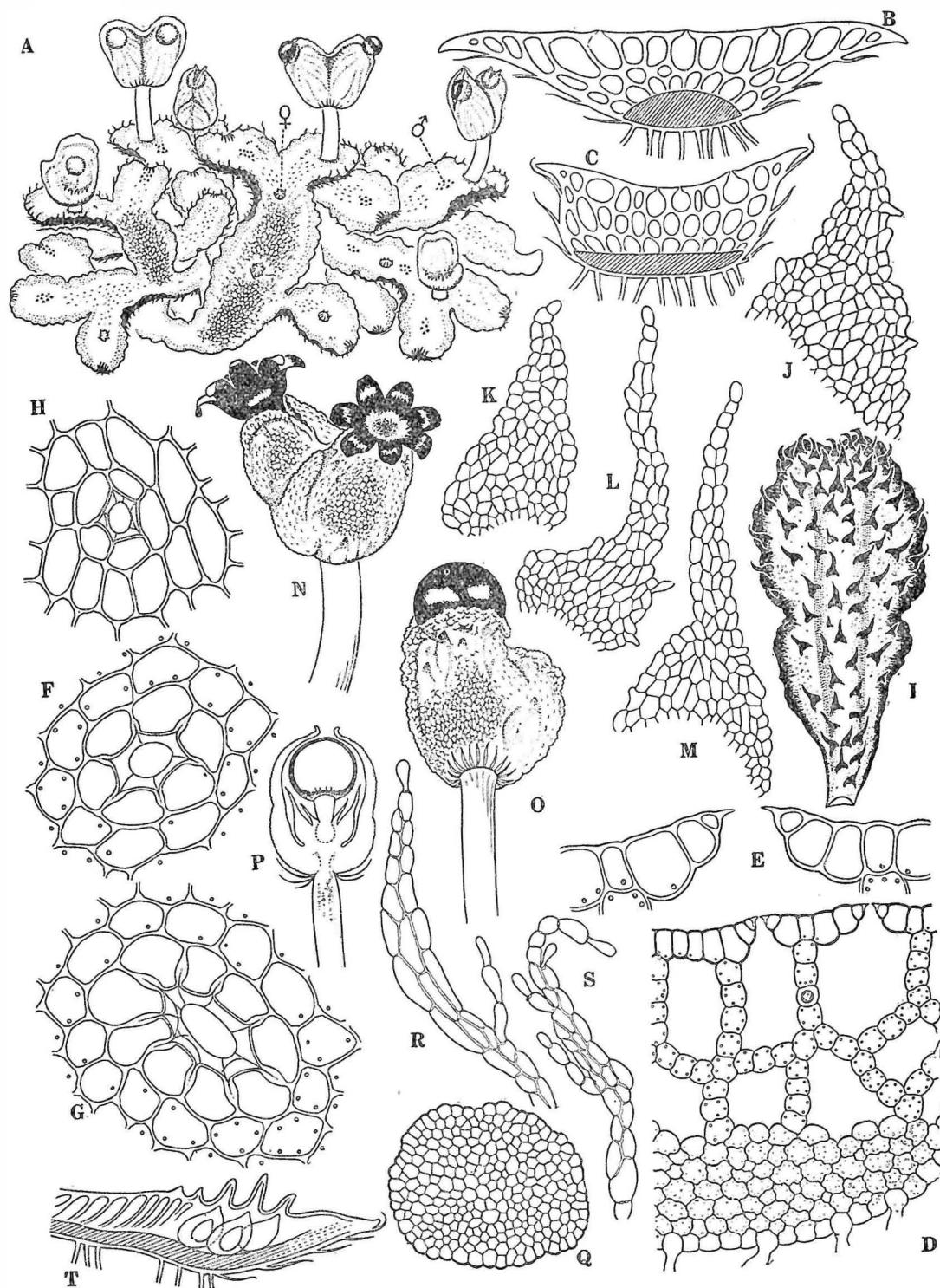
10) *Athalamia trabutiana* (Steph.) Hatt., comb. nov. *Cleva trabutiana* Steph., Spec. Hepat. 6: 5 (1917). Hab. Algeria. K. Müller (1952, p. 375-376) shortly described the present species comparing with *Cleva spathysii* K. Müll. which seems to be the nearest ally.

11) *Athalamia handelii* (Herz.) Hatt., comb. nov. *Cleva handelii* Herz. in Mazzetti, Symb. Sinic. 5: 2 (1930). Hab. N. W. Yunnan (known in sterile condition).

12) *Athalamia crassa* (Trabut) Hatt., comb. nov. K. Müller (1952, p. 373) remarks, " *Cleva crassa* Trabut (1942) aus dem algerischen Atlasgebirge unterscheidet sich von *C. hyalina* nur durch stärkere, herzförmige Verdickungen der

Text-fig. X. *Athalamia glauco-virens* Shimizu et Hattori

A. Plant, $\times 5$. B. Cross section of thallus (near apex), $\times 18$. C. Do. (near base), $\times 18$. D. Middle portion of (B), $\times 95$. E. Vertical section through pore of thallus, $\times 190$. F-H. Pores and adjacent cells of thallus, $\times 190$. I. Thallus, ventral view (showing scales), $\times 12$. J-M. Ventral scales of thallus, $\times 48$. N. Female receptacle with two sporangia splitted, $\times 12$. O. Do. with one sporangium not yet splitted, $\times 12$. P. Longitudinal section of female receptacle, $\times 35$. Q. Cross section of stalk of female receptacle, $\times 35$. R-S. Bractlets from base of female receptacle, $\times 48$. T. Longitudinal vertical section of thallus showing antheridia, $\times 18$. The figures were all drawn by D. Shimizu from the type specimen.



Text-fig. X

Radialwände der Atemöffnungen."

13) *Athalamia nana* (Shimizu et Hatt.) Hatt. comb. nov. *Gollaniella nana* Shimizu et Hatt. in Journ. Hattori Bot. Lab. 9: 34, Text-fig. 3, 5 (1953). Hab. Japan (Chichibu Mts.)

Doubtful species: *Plagiochasma pedicellatum* Griffith = *Cleva pedicellata* Lindb. Vide, Steph., Spec. Hepat. 1: 71. Hab. Assam.

8. *Athalamia glauco-virens* Shimizu et Hattori, spec. nov. (Text-fig. X, XI, A-H.)

Monoica; minor, glauco-virens, marginibus saepe violescentibus, ad rupes late prostrata. Frons valida, linearis, 5-9-12 mm longa, 1.5-2-3 mm lata, 2~3-furcata, antice subplana, sicca involuta, postice convexa, apice parum incisa. Costa valida, rotundata, subduplo angustior. Stratum anticum costae aequialatum (vel rarius subduplo altior), cavernis±densis, biseriatis, sed in area fertili unistratis et angustissimis, fila libera nulla. Stomata parum prominula, parietibus radialibus saepissime incrassatis, poro majusculo, (5)-6-7-(9) cellulis uniseriatis circumdato. Epidermidis cellulae distinctae, validae, pallidae (chlorophylli granulis paucis), parietibus±incrassatis, trigonis majusculis. Radiculae pallidae. Squamae posticae intense purpuratae, foliaceae, irregulariter 4~6-seriatae, marginem thalli apicem versus superantes, nunc supra marginem inflexae, nunc divaricatae, attenuatae, longe acuminatae et saepe setosae, subintegerrimae sed hic illic denticulosae, cellulis oleiferis nullis. Carpocephala dorsalia, pallide virentia, disco centrali subnullo, receptaculi lobi uni vel bini, oppositi, basi tantum coaliti, sursum patuli, ovati, ore bilabiato, labiis rotundatatis. Pedunculus±sulcatus, 0.6-2-3.5 mm longus, nudus, sed apice solum parvibarbatus, paleis pallidis, lanceolatis, plerumque 1~3-spinosis. Capsula breviter pedicellata, atrofusca, sphaerica, magno bulbo inserta, pariete unistrata, valida, fibris annularibus vel rarius semiannularibus instructa. Sporae majusculae, 40-50-60 μ in diametro, fuscae, minutissime verrucoso-asperae, alte papillatae, papillis 6-8-9 in diametro. Elateres flavo-brunnei, 120-180-240 μ longi, 8-12 μ crassi, vix attenuati, similiter minutissime verrucoso-asperae, in medio bi- vel trispiri. Antheridia fere pedunculo approximata, aggregata, irregulariter 2~3-seriata, subimmersa, ostiolis brevioribus. Gemmae nullae. Cellulae oleiferae in epidermis, stratis anticis, et in costis dispersae, sed in squamis ignoratae.

Hab. Among crevices of rocks (mostly clay-slate), south-facing shrubby slope, ca. 1040 m. alt., Kita-aiki in Minami-saku District, Nagano County, Middle Japan, August 18, 1953, Coll. D. Shimizu, No. 52767-Type in Herb. Hattori Bot. Laborato-

Text-fig. XI.

A-H. *Athalamia glauco-virens* Shimizu et Hattori

A. Fertile plant, $\times 12$. B-D. Spores, $\times 365$. E-F. Elaters, $\times 365$. G. Cells from capsule wall, $\times 365$. H. Oil-body, $\times 365$.

I-N. *A. glauco-virens* fo. *subsessilis* Shimizu et Hattori

I-K. Spores, $\times 365$. L-N. Elaters, $\times 365$.

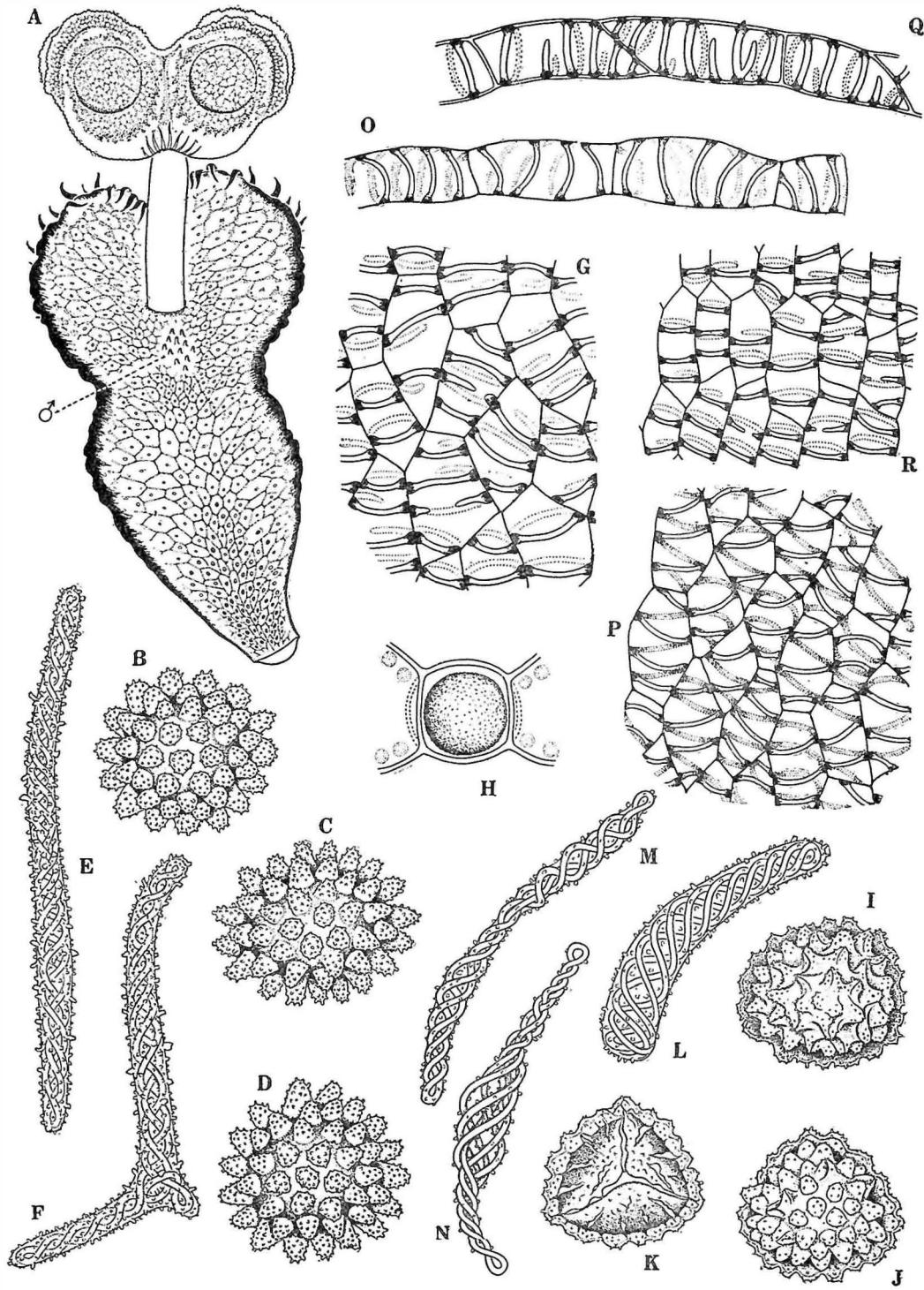
O-P. *Sauteria alpina* var. *japonica* Shimizu et Hattori

O. Cross section of capsule wall, $\times 190$. P. Cells from capsule wall, $\times 190$.

Q-R. *Peltolepis quadrata* var. *japonica* Shimizu et Hattori

Q. Cross section of capsule wall, $\times 190$. R. Cells from capsule wall, $\times 190$.

The figures were all drawn by D. Shimizu from each type specimens.



Text-fig. XI.

ry. Range: endemic.

Athalamia chinensis (Steph.) seems to be very closely related to the present species. Unfortunately the authors have not yet seen the authentic specimen of *A. chinensis*. However, in his original diagnose Stephani stated, "(*A. chinensis*) . . . virens vel purpurascens. Frons tenera, tenuis. Stomata parva, 5 cellulis constructis formata, stellatim incrassata. Squamae posticae apice capillaceae, hyalinae, interdum profunde bifidae. Pedunculus femineus 1 cm. longus. Receptacula triloba. Sporae ferruginea, 57-65 μ ." Further, in his unpublished *Icones Hepaticarum* the ventral scales of thallus and the bractlets on the tip of stalk of the female receptacle are both drawn as forming more or less conspicuous clusters.

9. *Athalamia glauco-virens* fo. *subsessilis* Shimizu et Hattori, fo. nov. (Text-fig. XI, I-N, XII).

A typo recedit: carpocephalis brevissime pedunculatis (0.5 mm vel minus), receptaculi lobis 1-3, globosis, sporis 32-45-54 μ in diametro, indistincte alatis.

Hab. Crevices of rocks (clay-slate, phyllite and cherts), south-facing exposed cliffs, ca. 700 m. alt., at Kaminakao of Otaki-mura, Chichibu Mts., Saitama County, Middle Japan, September 3, 1953, Coll. D. Shimizu, No. 52755-Type, Nos. 52768 & 52769; in Herb. Hattori Bot. Laboratory. Range: endemic.

The collection seems to be very closely allied to the type form. The plant is smaller, in rosette, ventral scales of thallus larger and more distinct, stalk of the female receptacle very short, less than 0.5 mm long, disk up to 3-lobed, spores 32-45-54 μ in diameter, often with more or less distinct wing, elaters 60-120-200 μ long, 6-14-20 μ thick, with 4-5-(6) spirals in middle portion. Oil-cells are seen in the partition of air chamber and rarely in ventral tissue of thallus.

Whether it may be genetically identical or not with the type form is still a question. Hence it may be better to propose tentatively a formal name "*subsessilis*" for this collection. But the authors will try to dissolve its generic relationship to the type form, collecting more material for comparative study of specimens and cultivations.

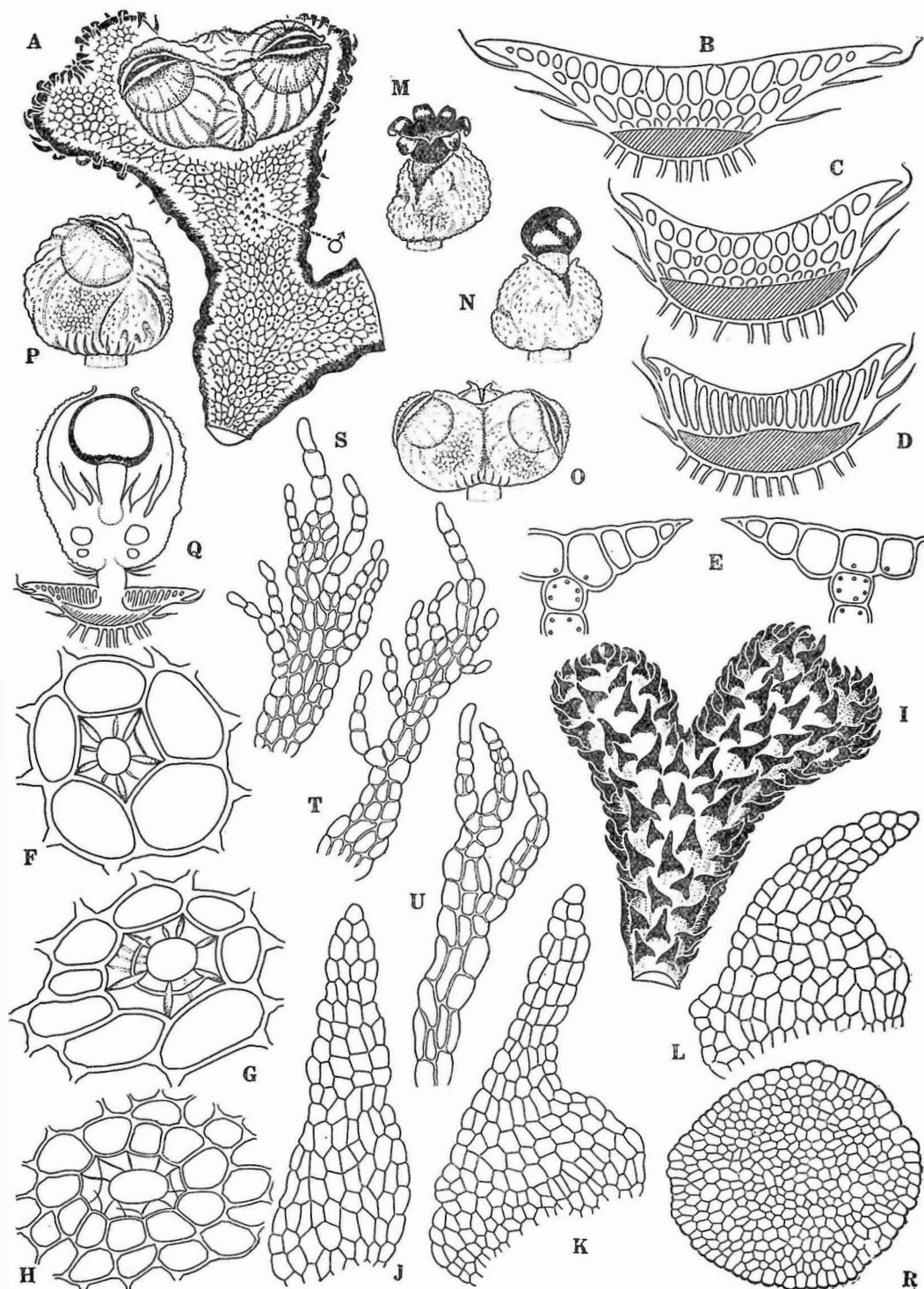
10. *Sauteria* Nees, Naturg. Europ. Lebem. 4: 139 (1838); K. Müll. in Rabenb., Krypt.-Fl., Bd. 6, Aufl. 2, Abt. 1: 243 (1907) & Aufl. 3, Lief. 3: 376 (1952); Frye & Clark, Hepat. of N. America, Pt. 1: 52 (1937).

Hampea Nees, 1. c., as synonym, not of Schlecht.

Saucchia Kashyap in Journ. Bombay Nat. Hist. Soc. 24: 347 (1916); Liverw. W. Himalayas & Panjab Pl., Pt. 1: 82 (1929), syn. nov.

Up to the present the genus *Sauteria* has comprised three species, *S. alpina*

Text-fig. XII. *Athalamia glauco-virens* fo. *subsessilis* Shimizu et Hattori
A. Fertile plant, $\times 12$. B. Cross section of thallus (near apex), $\times 18$. C. Do. (near base), $\times 18$. D. Do., showing slit-like air chambers (near antheridia), $\times 18$. E. Vertical section through pore, $\times 190$. F-G. Pores of thallus, $\times 365$. H. Do., $\times 190$. I. Thallus, ventral view, showing scales, $\times 12$. J-L. Ventral scales of thallus, $\times 48$. M-P. Various forms of female receptacles, $\times 12$. Q. Longitudinal section of female receptacle, $\times 12$. R. Cross section of stalk of female receptacle, $\times 48$. S-U. Bractlets from base of female receptacle, $\times 48$. The figures were all drawn by D. Shimizu from the type specimen.



Text-fig. XII.

Nees (genotype), *S. berteroana* Mont. and *S. crassipes* Aust.¹⁾ In 1916 Kashyap established the genus *Sauchia* which was represented by a new species endemic in Himalayas, *S. spongiosa* Kashyap only. The material, however, was rather scanty. In 1928 he collected more material from the original and several other localities, and the next year he amplified the original description from those specimens. At the same place he compared *Sauchia* with its ally, *Sauteria*, and remarked that the former differed in having thin-walled cells around the pores and its delicate texture.

Recently the authors (1953) described the second species of *Sauchia*, *S. japonica* Shimizu et Hatt., from Mt. Yatsu, Middle Japan, stating, " *Sauchia* seems to be very closely related to *Sauteria*." In the summer of last year Shimizu, one of the authors, collected at the same mountain another liverwort which has proved, after careful examination, to be possibly a local species of *Sauteria alpina*. The radial walls of the cells around the pore of thallus are slightly thickened or often rather thin and almost indistinct.

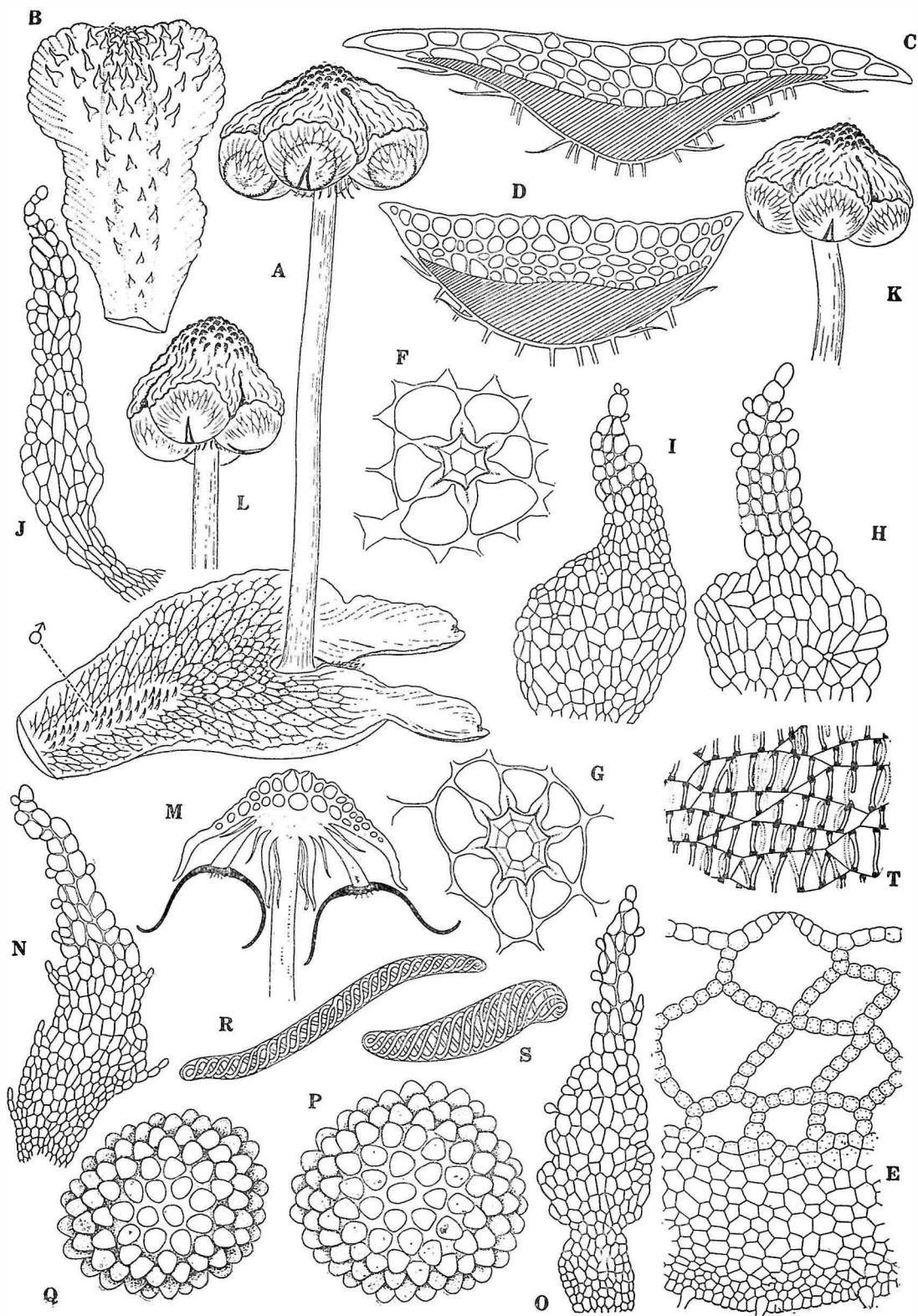
Thus the authors consider it solely can be no characteristic of generic value whether the cells around the pore have thin- or thick-walled radial walls. And yet, they can not find any other characteristics which are worthy to separate *Sauchia* from *Sauteria*. *Sauteria alpina* and its local species in Japan, *Sauchia spongiosa* and *S. japonica* are allied to each other, and represent one and the same natural taxon, that is the genus *Sauteria*.

Consequently *Sauteria* comprises at present six taxa, *Sauteria alpina*, and its local species in Japan (tentatively named, *S. alpina* var. *japonica*), *S. berteroana*, *S. spongiosa* (Kashyap) c. n., *S. japonica* (Shimizu et Hatt.) c. n., and little known *S. crassipes*. *S. alpina* (type form) has not been found (and seems to be represented by var. *japonica*) in Japan. Since they have had no detailed illustration of *S. alpina*, the authors consider it to be of need to illustrate the European type form together with var. *japonica* in order to show the distinctions between the two taxa, and by the way they wish to appoint the coincidence in the construc-

Text-fig. XIII. *Sauteria alpina* Nees

- A. Plant with female receptacle and antheridia, $\times 6$. B. Thallus, ventral view, $\times 6$. C, D. Cross sections of thallus, $\times 18$. E. Cross section of middle portion of thallus, $\times 48$. F, G. Pores of thallus, $\times 190$. H-J. Ventral scales of thallus, $\times 33$. K, L. Female receptacle, $\times 6$. M. Longitudinal section of female receptacle, showing two sporophytes, $\times 12$. N, O. Bractlets from base of female receptacle, $\times 33$. P, Q. Spores, $\times 365$. R, S. Elaters, $\times 190$. T. Thickening in wall of sporangium, $\times 190$. The figures B, C, E were drawn from G. Samuelson's collection (Sweden), I, F from A. Hülpfers' (Sweden), and the others from H. W. Arnell's collection (Jenisei). -All drawn by D. Shimizu.

1) *S. crassipes* has not been re-discovered since Austin published its diagnose, and yet the original specimen can not be located. *S. crassipes* is founded on only one collection made by Rogers Exp. probably in Japan. Stephani (Spec. Hepat. 1: 66. 1898) remarked, "Diese Pflanze liegt in keinem öffentlichen Herbar Americas oder Europas und scheint ganz verloren gegangen zu sein; nach der nichts-sagenden Diagnose des Autors dürfte sie kaum wieder zn erkennen sein."



Text-fig. XIII.

tion of bractlets on the tip of penduncle of female receptacle between *Sauteria* and *Sauchia* (see, Text-fig. XIII, N-O, XIV, M-N and also Kashyap's Plate XVII, 8). Kashyap (1929, p. 83) described that (bractlets) persistent, lanceolate, with a thin-walled proximal and a thick-walled distal half. This description in general fits all members of the present genus (also see, Shimizu & Hattori, 1953, Text-fig. II, M-N).

Sauteria spongiosa (Kashyap) Hatt., comb. nov. *Sauchia spongiosa* Kashyap in Journ. Bombay Nat. Hist. Soc. 24: 347 (1916); Liverw. W. Himalayas & Panjab Pl., Pt. 1: 82, Pl. 17 (1929). Range: Middle and Main Himalayas (9,000~14,500 feet).

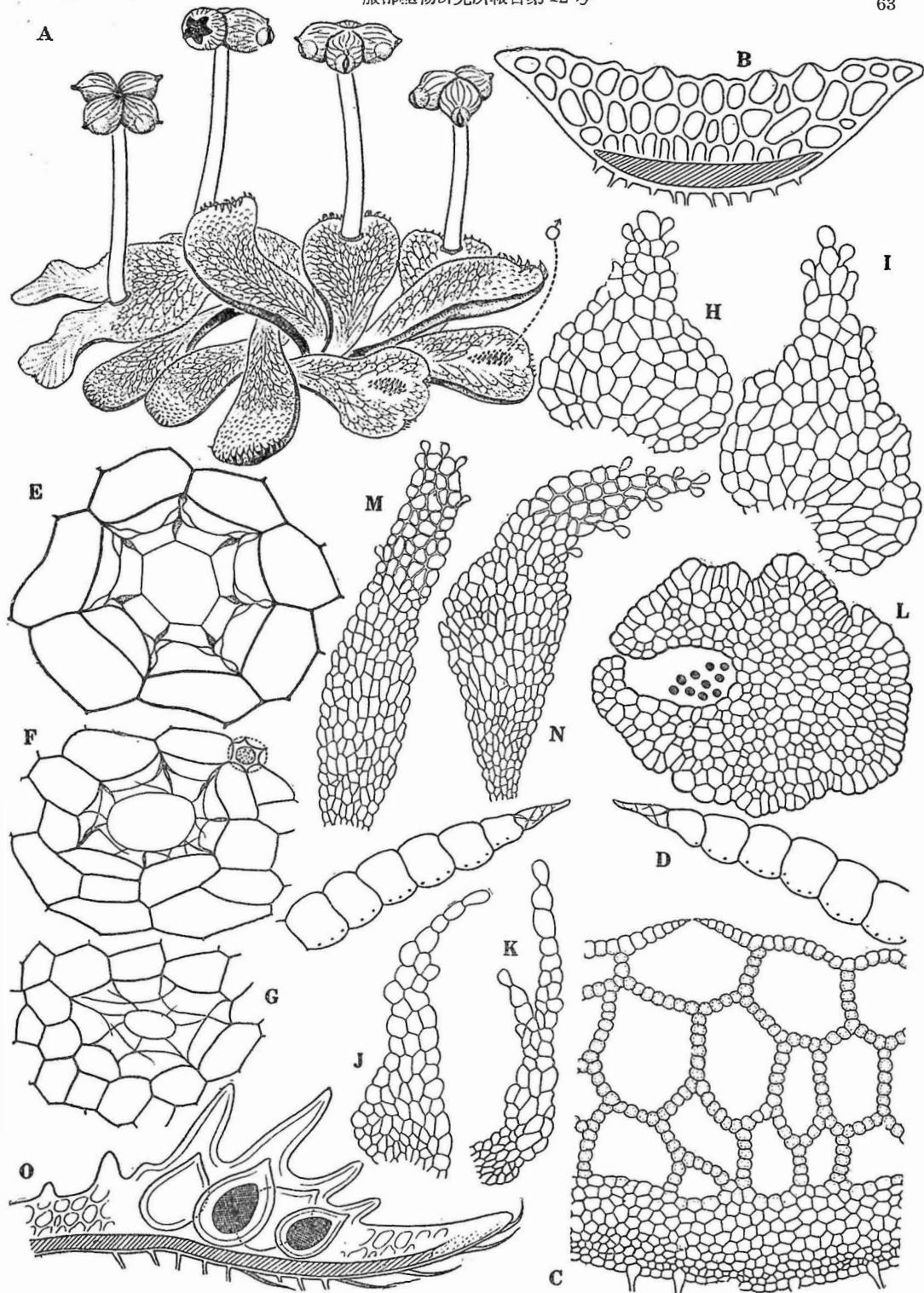
Sauteria japonica (Schimizu et Hatt.) Hatt., comb. nov. *Sauchia japonica* Shimizu et Hatt. in Journ. Hattori Bot. Lab. 9: 32, Text-fig. 2 & 3, g-j (1953). Range: known only from Mt. Yatsu, ca. 2800 m. alt., Middle Japan.

11. ***Sauteria alpina*** Nees, Naturg. Europ. Lebem. 4: 143 (1838); K. Müll. in Rabenh., Krypt.-Fl., Bd. 6, Aufl. 2, Abt. 1: 244, Fig. 150-151 (1907); Aufl. 3, Lief. 3: 376, Fig. 77 (1952); Frye & Clark, Hepat. of N. America, Pt. 1: 53, with 7 figs. (1937). *-Lunularia alpina* Nees; Bischoff et Nees in Flora 13: 399 (1830). (Text-fig. XIII).

Thalli pale to dull green, 10-17 mm long, 3-5 mm wide, 1-2 times dichotomous, convex beneath, upper surface clearly showing polygonal areas coinciding with air chambers beneath them. Ventral tissue 1/3 to 1/2 as thick and 2/3 as wide as thallus. Dorsal epidermis distinct, of 1 layer of cells, the cells usually thin-walled with more or less distinct trigones, almost hyaline (but containing a few small chloroplasts), often disappearing over the chamber with age. Air chambers in (2)-3-(4) layers. Pores elevated, bounded by 5-7-(8) cells; the radial walls of these cells distinctly thickened. Ventral scales colorless, in 3-(6) irregular longitudinal rows, oblong-ovate; their appendages oblong to lanceolate, gradually narrowed into a point, slime papillae present at the margin; scales sometimes without appendages, narrower and longer, almost lanceolate (see, Text-fig. XIII, H-J). Thalli bisexual, female and male organs in separate groups or more frequently the latter just below the former. Antheridia on a ventral branch, or on a part of a dichotomous branching, or just below the female receptacle, aggregate but never forming true receptacle. Female receptacle with stalk 5-15 mm long, terminal, in the deep notch of thallus apex, turning to locate at the fork of the two lobes which have successively elongated, or seemingly lateral (one of the lobes having been elongated); bractlets restricted at the base of receptacle, colorless, oblong to lanceolate, with many slime papillae (often 2-3 celled and spinulose), the cells of the proximal half smaller (but firmer) than those of the distal half; disk convex, tuberculate, with air

Text-fig. XIV. *Sauteria alpina* var. *japonica* Shimizu et Hattori

- A. Fertile plant, $\times 2.5$. B. Cross section of thallus, $\times 12$. C. Middle portion of (B), $\times 33$. D. Vertical section through pore, $\times 135$. E. Pore of thallus, $\times 365$. F-G. Do., $\times 135$. H-K. Ventral scales of thallus, $\times 33$. L. Cross section of stalk of female receptacle, $\times 48$. M-N. Bractlets from base of female receptacle, $\times 33$. O. Longitudinal vertical section of thallus showing antheridia, $\times 12$. The figures were all drawn by D. Shimizu from the type specimen.



Text-fig. XIV.

chambers and pores, deeply 2~5-lobed, the lobes extending outward at ca. 45 degrees with the stalk; involucres 2-lipped. Sporangium 1-5 per receptacle, opened by several splits from the tip backward; thickenings in the wall cell annular to semi-annular, or seemingly spiral. Spores brown, (56)-65-70-80 μ in diameter, warty (11-13 warts through a diameter). Elaters with 2-5 yellowish brown spirals, 10-20-28 μ thick, (60)-120-280-320 μ long. Oil-cells scattered in the ventral scales and the dorsal epidermis of thallus, rare.

Examinations. Siberia: Jenisei, Tolstoinos, 70°10' N. Lat., August 30, 1876, Coll. H. W. Arnell; from Herb. R. M. Schuster. Greenland: Lyall Land, w. side of glaciers, on Narwahl Sound, August 22, 1937, Coll. H. J. Oosting; from Herb. R. M. Schuster. Sweden: Torne Lapmark, Coll. G. Samuelson; ex herb. R. M. Schuster. Jämt, Frostriken Su. Jorm, Blajofallet, fuktiga Skifferklippor, 1. IX. 1934, A. Hülphers; ex herb. H. Persson.

12. *Sauteria alpina* var. *japonica* Shimizu et Hattori, var. nov. (Text-fig. XI, O-P, XIV, XV, A-H).

A typo recedit: stomata haud stellata, parietibus radialibus vix incrassatis, nec stellatim confluentibus, receptaculo feminei plano, non convexo-prominulo (stomata ignorata), lobis minime decurvis (sub angulo ca. 60° patentibus).

Thalli thick, not so firm in texture, pale to light green, 10-15 mm long, (3)-5-7 mm wide, sparingly dichotomous, oval, upper surface clearly showing polygonal areas corresponding with the underlying air chambers. Vein constituting a broad rounded ventral keel, 1/4 as thick and 1/2 as wide as thallus. Ventral scales colorless, in 3-5-(6) irregular longitudinal rows, usually with slime papillae at the margin, ovate or lanceolate, narrowed into one-celled apical point, hardly reaching thallus margin and not forming a conspicuous cluster at thallus apex. Dorsal epidermal cells distinct, in 1-layer, pallid, more or less chlorophyllose, thin-walled, without trigones, disappearing over the chambers with age. Air chambers large, in 2-3 layers, without supplementary partition. Pores elevated, usually bounded by 7 cells with more or less thickened (or sometimes thin and indistinct) radial walls. Thalli bisexual. Antheridial group more or less definite, dorsal, in 3-4 irregular rows, without surrounding bractlets, on the different branches from, or sometimes just below, the female one. Female receptacle stalked, terminal, in deep notch of thallus apex, sometimes turning to locate in the fork of the two lobes (by the successional elongating of both lobes, leaving the receptacle backward), or sometimes seemingly lateral (by the successional elongating of either lobe;

Text-fig. XV.

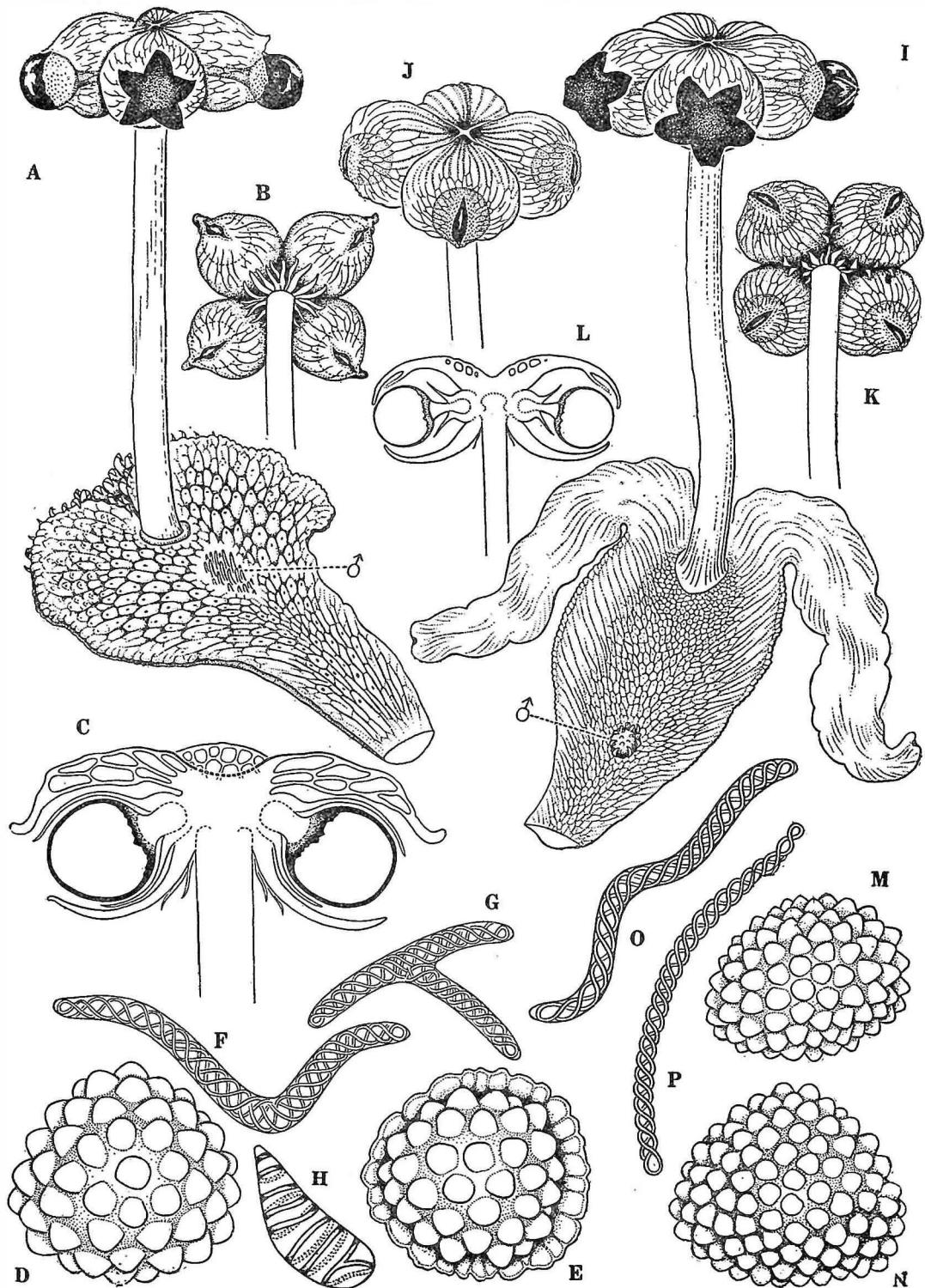
A-H. *Sauteria alpina* var. *japonica* Shimizu et Hattori

A. Fertile plant, $\times 6$. B. Female receptacle showing bilabiate mouths of involucres and many linear bractlets attaching to the base, $\times 6$. C. Longitudinal section of female receptacle, $\times 12$. D-E. Spores, $\times 365$. F-H. Elaters, $\times 190$.

I-P. *Peltolepis quadrata* var. *japonica* Shimizu et Hattori

I. Fertile plant, showing wing-like innovations at the apex, $\times 6$. J. Female receptacle showing bilabiate mouths of involucres and many short bractlets attaching to the basal part, $\times 6$. L. Longitudinal section of female receptacle, $\times 6$. M-N. Spores, $\times 365$. O-P. Elaters, $\times 190$.

The figures were all drawn by D. Shimizu from each type specimens.



Text-fig. XV.

pseudolateral); stalk pallid, 8–10–14 mm long, ± sulcate, with many bractlets on tip, these bractlets appressed to disk, white, lanceolate, the distal 1/3 of bractlet having larger (but less firm) cells than the proximal 2/3, marginal slime papillae restricted in the distal 1/3; disk pale green, 3–4 mm wide, 2–3 mm thick, flattish above and never convex in the center, with small air chambers lacking pores, deeply (2)–4–5-lobed, the lobes extending outward at about 65–75 degrees with the stalk. Involucr ovate, 2-lipped, the upper edge faintly rostrated. Sporangia 1–4 in each receptacle, opening by 4–5 splits from the tip backward; thickenings within the wall cells, incomplete spiral. Spores dark brown, 60–72 μ in diameter, distinctly warty (measuring 7–9 warts through a diameter), winged or not, wing wavy, often incomplete. Elaters 160–200–220 μ long, 14–17–20 μ wide, with 4–5 yellowish brown spirals in the middle. Oil-cells scattered in ventral tissue of thallus and bractlets of female receptacle (and also in ventral scales of thallus?), very rare. Oil-bodies large and globose (36 μ in diameter), yellowish gray, compound of spherules.

Hab. Among rock-crevices and moist surface of agglomerate bluff facing west by south, ca. 2500 m. alt., Mt. Yatsu, Nagano County, August 22, 1953, Coll. D. Shimizu, No. 52828-Type, Nos. 52745–52747; all in Herb. Hattori Bot. Laboratory. Range: known only from Mt. Yatsu, central Japan.

The Japanese form (var. *japonica*) of *Sauteria alpina* is distinct from the European type form by (1) never convex disk of female receptacle lacking pores and its lobes extending outward at 65–75 degrees with the stalk, and (2) not so thickened (and often thin and indistinct) radial walls of cells around the pore of thallus.

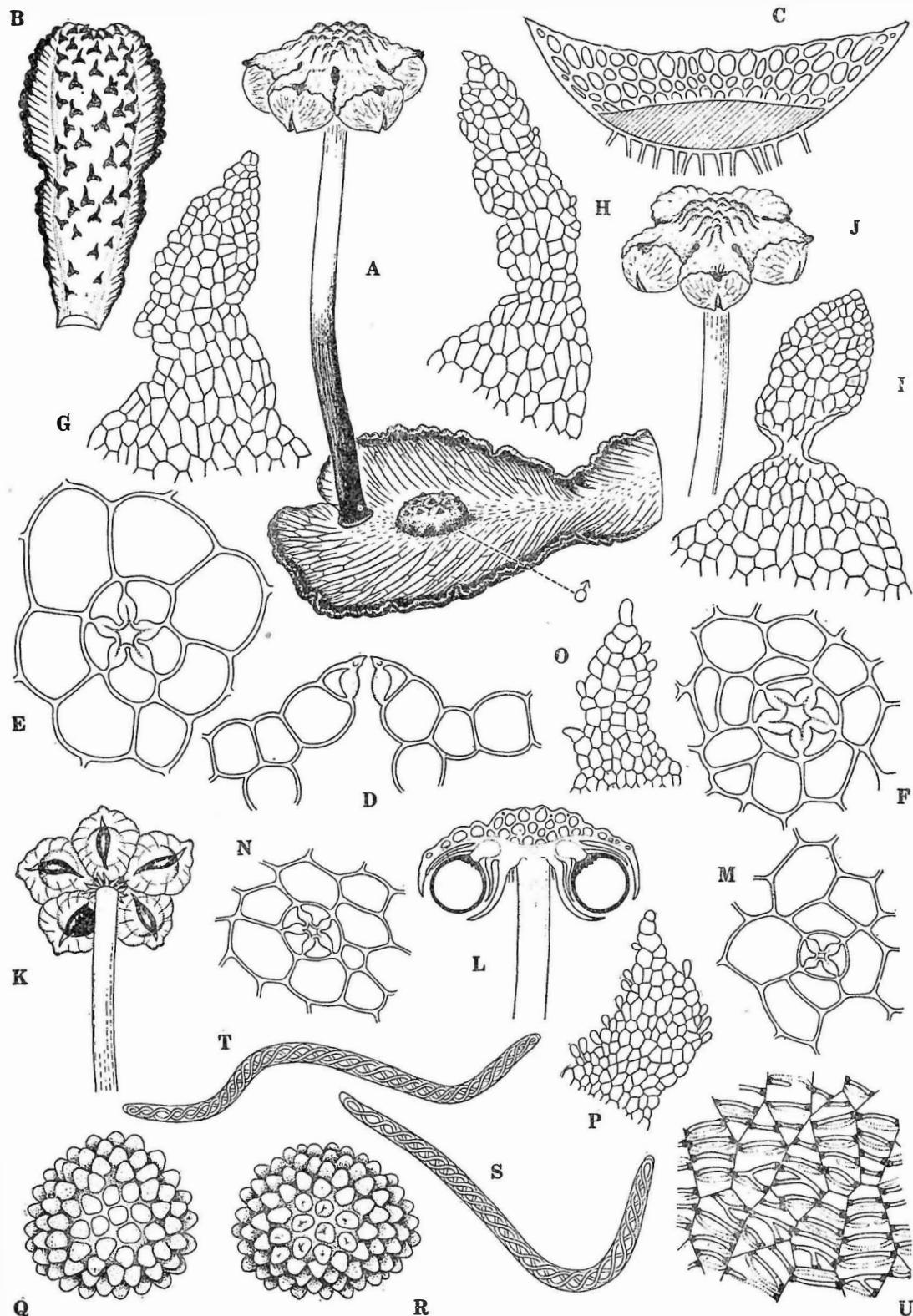
It is worth noting that the Japanese form (var. *japonica*) occurs on volcanic rocks, such as agglomerate. On the European type form, K. Müller (1952) stated, “*Sauteria* lebt, ebenso wie *Cleva hyalina* und *Peltolepis*, auf Alpenhumus in Kalkgebirgen mit neutraler bis schwach basischer Bodenreaktion.” Outside Europe, *Sauteria alpina* was recorded from Greenland to North America, Lat. 40°~80°N. and Siberia, Lat. 60°~75°N. Further it was recorded in India (Kashmir, Liddar Valley, 13,000 feet) by Stephani. However no one else has re-discovered that. It may be necessary to re-examine the collection that was identified by Stephani to *Sauteria alpina*.

13. *Peltolepis* Lindberg in Bot. Notiser, 73 (1877); K. Müll. in Rabenh., Krypt.-Fl., Bd. 6, Aufl. 2, Abt. 1: 246 (1907) & Aufl. 3, Lief. 3: 378 (1952); Frye & Clark, Hepat. of N. America, Pt. 1: 54 (1937).

The genus is represented by only one species, *P. quadrata* (Sauter) K. Müll.

Text-fig. XVI. *Peltolepis quadrata* (Sauter) K. Müll.

A. Plant with female receptacle and (♂) antheridial one, $\times 6$. B. Thallus, ventral view, $\times 6$. C. Cross section of thallus, $\times 18$. D. Vertical section of pore of thallus, $\times 190$. E, F. Pores of thallus, $\times 190$. G-I. Ventral scales of thallus, $\times 48$. J. Female receptacle, $\times 6$. K. Underside of female receptacle, showing 5 sporangia in each involucres, and basal bractlets, $\times 6$. L. Longitudinal section of female receptacle, showing two sporophytes, $\times 12$. M, N. Pores of female receptacle, $\times 190$. O, P. Bractlets from base of female receptacle, $\times 48$. Q, R. Spores, $\times 190$. S, T. Elaters, $\times 190$. U. Thickenings in wall of sporangium, $\times 190$. The figures were all drawn by D. Shimizu from Ch. Meylan's collection (Jura).



Text-fig. XVI.

which widely ranges in the northern hemisphere north of Lat. about 45°N., but is rare. It is calciphile growing on calcareous sites, and alpine in its southern distributional areas (see, K. Müll. 1952, p. 381).

The authors collected last year a local species of the present species, together with *Sauteria alpina* var. *japonica*, at Mt. Yatsu, Central Japan. It seems to be most remarkable that *Sauteria japonica* (Shimizu et Hatt.) and each local species (var. *japonica*) of *Sauteria alpina* and of *Peltolepis quadrata* occur in Mt. Yatsu and not yet found elsewhere. Mt. Yatsu is an old, dormant volcano, embracing many peaks, the highest of them 2899 m. above sea level. It lies in central Honshu of Japan, roughly at Long. 139°E., Lat. 35°30'N., and is constructed by volcanic rocks, such as agglomerate and andesite, possibly of Neogene or Pleistocene, and there is no trace of limestone.

Three liverworts mentioned above are found at elevations more than 2250 m.: *Sauteria alpina* var. *japonica*, ca. 2500 m. alt., *S. japonica*, ca. 2800 m. alt. and *Peltolepis quadrata* var. *japonica*, 2250–2450 m. alt. It may be worth to point that Japanese form of *Sauteria alpina* and *Peltolepis quadrata* occur on agglomerate, while the type forms of both are calciphile according to European and American literature.

The authors do not see a detailed illustration of *Peltolepis quadrata*, and, for comparison, it may be better to illustrate here the type at first and then the Japanese form of the species.

14. *Peltolepis quadrata* (Sauter) K. Müll. in Hedwigia, 79: 75 (1940); in Rabenh., Kryps.-Fl., Bd. 6, Aufl. 3, Lief. 3: 379, Fig. 79–80 (1952). *Sauteria quadrata* Sauter in Mitt. Ges. Salzb. Landesk. 11: 27 (1871). (Text-fig. XVI)

Peltolepis grandis Lindb. in Bot. Notiser, 1877: 74 (1877); K. Müll. 1. c. Aufl. 2, Abt. 1: 347, Fig. 152–153 (1907); Frye & Clark, Hepat. of N. America, Pt. 1: 54, with 7 figs. (1937).

Peltolepis sibirica Lindb. in Acta Soc. Faun. Fl. Fenn. 2 (3): 4 (1882).

Thalli firm and robust, usually green above, purplish along margin and beneath, 3–5 mm wide, 10–15 mm long, 1–2 times dichotomous, convex below, upper surface showing polygonal areas, one over each air chamber. Ventral tissue about half as thick and 3/5 as wide as thallus. Air chambers in 2–3 layers. Pores elevated, mostly stellate, bordered by 5–6 cells; the thickenings of their radial walls ovate-lanceolate in surface view. Dorsal epidermis distinct, of one layer of cells, the cells mostly colorless, walls more or less thickened, trigones not so distinct. Ventral scales in 3–5 irregular longitudinal rows, usually purplish, their appendages ligulate or oblong-lanceolate, narrowed toward the tip, mostly ending to a point, with 1-celled slime papillae at the margin. Thalli bisexual. Antheridial receptacles dorsal, circular to oblong, elevated, below the female one, or often on different branches from the female. Female receptacle terminal, in more or less deep notch of thallus apex (one or both lobes of it often successively elongate, thus the receptacle seemingly lateral or in the fork of the two lobes); stalk 5–11 mm long, more or less purplish to violet; bractlets restricted and appressed to the base of female receptacle, oblong to lanceolate, with many 1-celled slime papillae; disk somewhat convex, tuberculate, deeply 2–5-lobed, more or less purplish, with small air chambers and pores, pores usually stellate; involucres 2-lipped, extending

outward at 45–50 degrees with the stalk. Sporangium 1–5 per receptacle, opened by several splits from the tip backward, the wall cell with annular to semiannular thickenings. Spores brown, 40–48–52–(56) μ , warty (9–11 warts through a diameter). Elaters with 3 yellowish brown spirals 8–12 μ thick, 200–280–320 μ long. Oil-cells rare, scattered in dorsal epidermis of thallus; not confirmed in ventral scales.

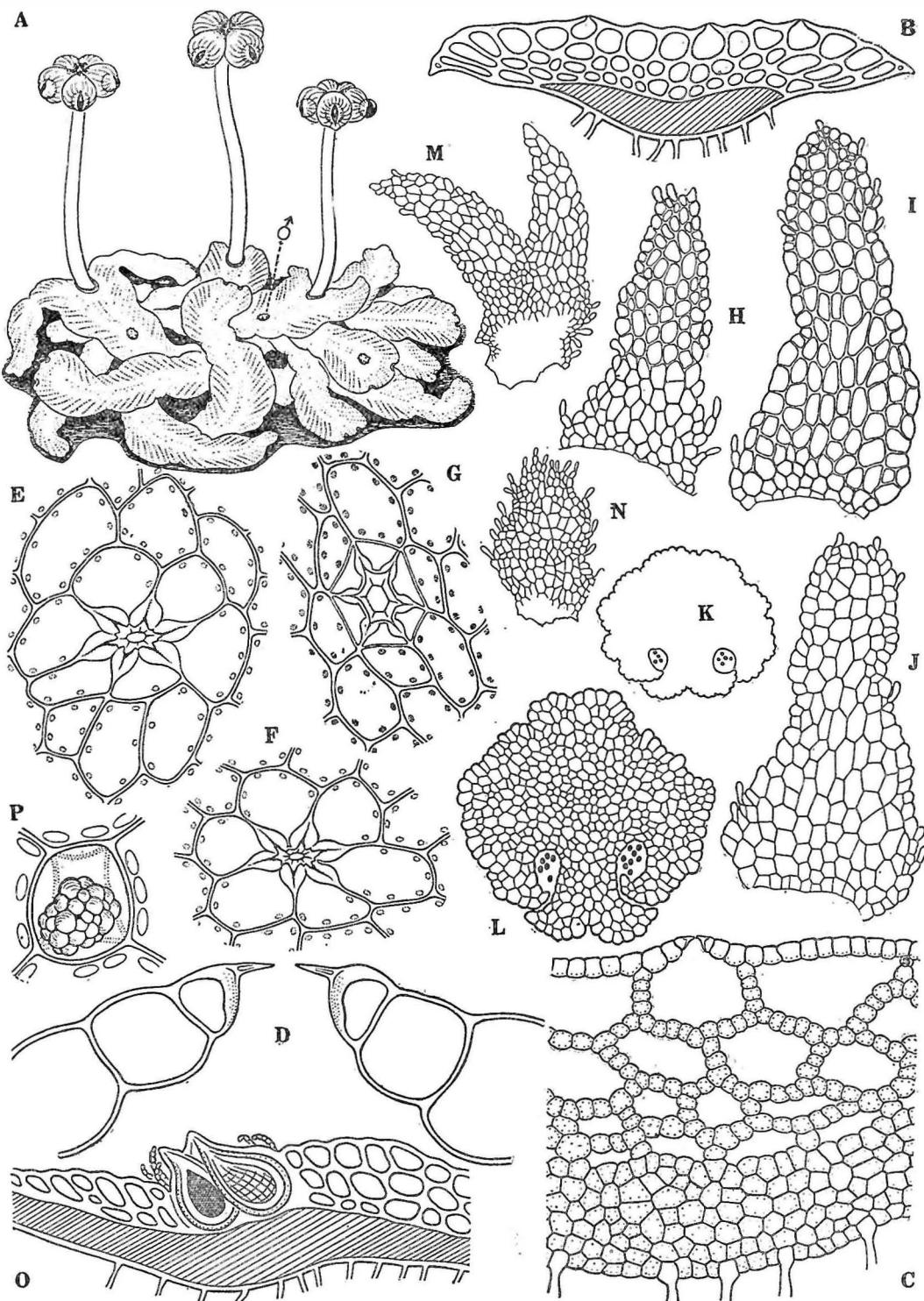
Examinations. Helvetia: Bern, Faulhorn, humicola i. lapides, skiophila, c. *Fimbriaria*, 2300 m., Aug. 1906, Coll. et Det. P. Culmann; -Verdoorn ed., Hepat. Select. et Critic. Ser. 10, No. 472 (1937). Jura: Colombier de Gex, dans un Creux a neige, 1650 m., Sept. 1, 1900, Coll. Meylan; from herb. H. Persson.

15. *Peltolepis quadrata* var. *japonica* Shimizu et Hattori, spec. nov. (Text-fig. XI, Q-R, XV, I-P, XVII)

Diffrer a typo: thallis minoribus, minus validis, receptaculo feminei plano, disco centrali vix definito, non prominente, lobis haud decurvis (sub angulo 75°~85° patentibus).

Thalli somewhat thick, but not so firm in texture, pale or light green, occasionally violescent along margin, dull or pale green beneath, 10–20 mm long, 3–5 mm wide, sparingly dichotomous, upper surface showing small polygonal areas, one over each air chamber. Vein constituting a broad convex ventral keel, ventral tissue 1/3~1/2 as thick and 1/2~2/3 as wide as thallus. Ventral scales in (2)–3–4 irregular longitudinal rows, ovate, colorless or somewhat violescent, appendiculate, appendages one, large, their margins with slime papillae (often two-celled at scale base). Dorsal epidermis distinct, of one layer of cells, the cells containing few chloroplasts, almost colorless, walls thin or more or less thickened, trigones small or indistinct. Air chambers in (1)–2–3 layers, without supplementary partition. Pores slightly elevated, bordered by (4)–6 cells; radial walls of those cells thickened, the thickening generally ovate-lanceolate in surface view, thus the pore more or less stellate. Thalli bisexual. Antheridial receptacles dorsal, below the female one, or often on the different branches from the female, not limiting the growth of the thallus, circular in outline, elevated, with small marginal bractlets, the bractlets lanceolate, more or less purplish. Female receptacle stalked, terminal, in deep apical notch of thallus, sometimes soon situated in the fork of the two lobes of thallus by the successional elongating of both lobes; one or both of those elongating lobes often turning out backward (see, Text-fig. XV, I); stalk pallid to pale green, 5–14 mm long, weakly sulcate, with many bractlets on tip, bractlets appressed to the disk, white or rarely more or less purplish, oblong-lanceolate, small, with many slime papillae; disk about 4 mm wide, 2–3 mm thick, flatish above and never convex in the center, with small air chamber lacking pores, deeply (2)~4~(6)-lobed, the lobes extending outward at 75–85 degrees with the stalk. Involucrum ovate, 2-lipped. Sporangia (1)–2–5 in each receptacle, opening by 4–5 splits from the tip backward; thickenings within the wall cell brown, annular or semiannular. Spores yellowish brown to brown, 40–60–(70) μ in diameter, distinctly warty (measuring 9–10–11 warts through a diameter), without wing. Elaters (160)–200–280 μ long, 8–12–(16) μ wide, with 3 yellowish brown spirals in the middle. Oil-cells scattered only in the wall cells of air chambers, just below the epidermal layer, and not recognized elsewhere (see, Text-fig. XVII, C).

Hab. Among rock crevices or moist surface of conglomerate cliff along moun-



Text-fig. XVII.

tain stream running down east, 2250–2300 m. alt., near the uppermost limit of coniferous forest, Mt. Yatsu, Nagano County, Middle Japan, August 21, 1953, Coll. D. Shimizu, No. 52826-Type!, Nos. 52748–52752; Do., ca. 2450 m. alt., August 11, 1952, Coll. D. Shimizu, No. 52797; -all in Herb. Hattori Bot. Laboratory. Range: known only from Mt. Yatsu, central Honshu, Japan.

From the European type the Japanese form differs in its female receptacle which is flattish above and never convex in the center and lacks pores, and its lobes extending outward at 75–85 degrees with the stalk. It was found only at the height of 2250–2450 m. of Mt. Yatsu, central Honshu, and not elsewhere. The type, however, widely ranges, though very rare, in Europe, Spitzbergen, Greenland, Siberia (Jenisei), Ellesmere Land and North America (British Columbia). Var. *japonica* occurs on agglomerate, while the type calcareous sites (calciphile). It may be regarded as a local species representing the European type in Far East.

16. *Cryptomitrium* Aust., Underw. in Bull. Ill. State Lab. Nat. Hist. 2: 36 (1884); Howe in Mem. Torrey Bot. Club, 7: 43, Pl. 93–94 (1889); Kashyap, Liverw. W. Himalayas & Panjab Pl., Pt. 1: 58 (1929); Frye & Clark in Publ. Puget Sound Biol. Station 6: 17, Fig. 1–14 (1928); Hepat. of N. America, Pt. 1: 68, with 14 figs. (1937).

Massalongoa Steph. in Hedwigia, 64: 74 (1905); Spec. Hepat. 6: 65 (1917), syn. nov.

The genus *Massalongoa* is represented by only one species, *M. tenera* Steph. (1905, 1917), restricted in Mussoorie, Himalayas. Since collected by Gollan at the original locality, it has been re-discovered by no one else. And no one has added further knowledge to Stephani's diagnoses (1905, 1917) on this remarkable liverwort. In 1915 Kashyap described the second species of *Cryptomitrium*, *C. himalayense* Kashyap, from Mussoorie, Simula, 6000–7000 feet. However, consulting all available literature, *Massalongoa tenera* and *Cryptomitrium himalayense* are thought to be of the same taxon. By the way the authors wish to call attention to that both liverworts were collected at the same area, Mussoorie.

As to the genus *Cryptomitrium*, Erye & Clark (1937, p. 69) noted that the characters separating *Mannia* from *Cryptomitrium* are doubtfully of generic value: the former has the antheridia on a separate branch or plant, and has an unlobed pseudoperianth²⁾; the latter has the antheridia posterior to the archegonial branch and has a deeply lobed pseudoperianth²⁾. The authors agree with their opinion and regard *Cryptomitrium* as a subgenus of *Mannia*. Among the members of *Mannia*, *M. rupestris*, *M. pilosa* and *M. longiseta* formerly belonged to the genus *Neesiella* which has been thought to be synonymous with *Mannia*. However, *Ne-*

Text-fig. XVII. *Peltolepis quadrata* var. *japonica* Shimizu et Hattori

- A. Plant, ×6.
 - B. Cross section of thallus, ×18.
 - C. Middle portion of (B), ×48.
 - D. Vertical section through pore of thallus, ×365.
 - E-G. Pores of thallus, ×190.
 - H-J. Ventral scales of thallus, ×48.
 - K. Cross section of stalk of female receptacle, ×36.
 - L. Do., ×48.
 - M-N. Bractlets from base of female receptacle, ×48.
 - O. Longitudinal vertical section of thallus showing antheridia, ×18.
 - P. Oil-body, ×365.
- The figures were all drawn by D. Shimizu from the type specimen.

2) This means involucrum.

*Neesiella*³⁾ seems to be distinct from *Mannia* in several important features, and much allied to *Cryptomitrium* rather than *Mannia*, as follows:

- A) Green tissue compact in structure (with crowded vertical supplementary partitions), plant usually of xerophytic habit (margin of the thallus incurved when dry), epidermal cells of thallus valid, walls thick, usually with conspicuous trigones, disk of female receptacle 3~4-lobed, involucres not bilobed.....(Subgen.) *Mannia* (*M. fragrans*-type!, *M. dichotoma*, *M. sibirica*, *M. californica*, *M. indica*, *M. brachypoda*, *M. levigata*, etc.)
- A) Green tissue loose in structure (usually without crowded supplementary partitions), plants not of xerophytic habit; epidermal cells of thallus not valid, walls thin, mostly without or with small trigones, disk of female receptacle not 3~4-lobed, involucres usually bilobed(Subgen.) *Cryptomitrium*
- a) Disk of female receptacle almost semispherical, involucres sometimes not so distinctly bilobed, extending almost up to the margin, antheridia mostly on a separate branch from the female ones
.....(Sect.) *Neesiella* (*N. rupestris*-type, *N. pilosa*, *N. longiseta*)
- a) Disk of female receptacle flat, involucres deeply bilobed, extending about half way to the margin, antheridia posterior to the female receptacle.....
.....(Sect.) *Cryptomitrium* (*C. tenerum*-type, *C. himalayense*)

As shown in the above key, the authors consider *Cryptomitrium* and *Neesiella* to be more closely allied to each other than the latter to *Mannia* (sensu strict.). Here they wish to call particular attention to that the representative members of *Neesiella* have not 3~4-lobed disk of female receptacle and its involucres are bilobed. They suppose that *Cryptomitrium* may be a distinct genus separable from, or a subgenus of, *Mannia*, and *Neesiella* may be a section, or a subgenus, of *Cryptomitrium*.

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本号には *Athalamia* (ゲンバイゼニゴケ属—新称) の 1 新種及びその 1 型, *Sauteria* (デンチョウゴケ属) 及び *Peltolepis* (ヤツガタケゼニゴケ属—新称) の新変種を記載し, 併せて両種の基本種を図説した。上記 3 属はゼニゴケ目のうちで特殊な 1 群 *Sauteriaceae* (デンチョウゴケ科) を構成し, 我国には未確認の属である。尙, *Cleva* 及び *Gollaniella* 両属をゲンバイゼニゴケ属の, 又 *Sauchia* 属をデンチョウゴケ属の, 更に *Masalongoa* 属を *Cryptomitrium* 属の夫々異名とし, 新しい分類を提案した。

3) *Neesiella* Schiffn. in Engl. & Prantl, Nat. Pfl.-fam. I, Abt. 3: 32 (1893). Syn. *Duvalia* Nees (1817), nec Haworth (1812). Genotype: *N. rupestris* Schiffn.=*Duvalia rupestris* Nees.

Athalamia glauco-virens (グンバイゼニゴケ) は *A. chinensis* に極めて近いが、遺憾乍ら未だ後者の原標本にあたつていないので充分な比較が出来ない。本属は古い山地に不連続的に分布し、東亞では支那以外に我国の秩父山地（信濃側を含め）に 3 種（但し 1 種は未発表）見出されるに過ぎない。

デンチョウゴケ属には今迄 3 種（但し 1 種は疑問種）が知られていたが、今度 *Sauchia* を異名にしたのでその 2 種が加わる。基本種 *S. alpina* は著名である。新しく記載した変種はそのローカル スペシースと見ることが出来、八ヶ嶽の特産である。

ヤツガタケゼニゴケ属は著名な *Peltolepis quadrata* 只 1 種を含む。今回記載した変種は前者同様そのローカル スペシースと見られ八ヶ嶽特産である。

S. alpina var. *japonica* (ヤツガタケデンチョウゴケ), *S. japonica* (= *Sauchia japonica*, タカネゼニゴケ) 及び *Peltolepis quadrata* var. *japonica* (ヤツガタケゼニゴケ) の 3 種は八ヶ嶽の高さ 2250~2800 m. の集塊岩上にのみ発見された。ヤツガタケデンチョウゴケ及びヤツガタケゼニゴケの基本種は何れも欧洲アルプス、北米（北緯 40 度）以北に点々乏しく分布し、好石灰岩性と言う。タカネゼニゴケはヒマラヤ特産の *S. spongiosa* に近縁がある。かかる顧者な 3 種が八ヶ嶽亜高山帯～高山帯に局限され、秩父山地や南アルプスなど石灰岩の露出もある近接地域に見出されぬ点は注目に値する。ヤツガタケデンチョウゴケ及びヤツガタケゼニゴケの基本種の日本に近い产地はシベリアのエニセイ及び北米の北部などである。

以上の事実から考えて八ヶ嶽フロラは深い興味をそそる。木曾御嶽や乗鞍岳などと同時（第 4 紀）に成立した火山と言われるが、それより一段古く、少くとも洪積世中葉迄に成立したのではないだろうか。序乍ら *Rebouliaeae* に属する *Mannia* や *Asterella* などの稀種、固有種が秩父山地と南アルプスに集中的に発見されていることを指摘したい。例えば九州にはこの両属は全然未記録である。

8. グンバイゼニゴケ（新称）*Athalamia glauco-virens* 雌雄同株、葉状体は厚く硬い、帶紫蒼緑色～青紫緑色、縁は暗紫褐色に染まり、体の長さ 5~9~12 mm, 巾 1~2~3~(3.5) mm, 又状分枝は 2~3, 先端は浅く切れ込み、中肋部の厚さは葉状体前部で 1/2, 後部 1/3, 巾は葉状体前部 1/4~3/5, 後部 1/3~1/2 を占め、腹面に著しく又はややゆるく突出、気室は 2~(3) 層、中形、雌雄花に接する部位の気室は狭く、1 層、気室孔は少しづつ突出、孔辺細胞は (5)~6~7~(9) 個、1 列、膜は放射状に肥厚、表皮細胞は 1 様に少しづつ肥厚、角隅は三角形、僅かに葉緑粒を含み、基礎組織の細胞膜は肥厚せず、处处に小形の細胞を挟む、腹鱗片は不規則に 4~6 列、隋円形～半月形、紫紅色、附屬物は 1、披針形、縁辺の細胞はしばしば乳頭状に突出、油細胞を欠き、葉状体の頂端～縁辺に生ずる鱗片は背面に超出反捲、乾燥すれば特に著しい。雌器托は葉状体の頂端に生ずるも、先端はその後もひきつき伸長するため次第に後方に位置するようになり、托は淡緑色～白緑色、直徑 1.5~3 mm、高さ 1.5~2.5 mm、囊状、又は厚みのある軍配状（包膜 2 の場合）、托組織は殆ど無く、1~2 包膜より成り、熟すればやや斜上向に 2 層状に開口、表皮細胞は乳頭状にふくらみ、雌器托柄は無色、長さ 0.6~2~3.5 mm、表面の稜条は浅く、仮根溝を欠き、横断面の細胞に小三角形の角隅あり、柄上部の雌器托に接する部分に披針形（0~1~3 刺毛を有する）、無色の鱗片を上向きに生ずる。胞子囊は 1 器托上に 1~2 個、黒褐色、熟すれば包膜外に超出、5~7 片、花弁状に裂開、壁細胞には環状～半環状の肥厚帯を具へ、胞子囊柄は短かい。胞子は暗褐色～濃褐色、直徑 40~50~60 μ 、表面に高い疣状突起（直徑線上に 6~8~9 個）を生じ、全面に微小な屑様～疣状の突起を散布、彈糸は淡褐色～淡黄褐色、長さ 120~180~240 μ 、太さ 8~12 μ 、表面に屑様～疣状の微小突起を散布、2~3 らせん糸を具へる。雄器は葉状体中肋上、雌花の後部、又は前後に接するか、雌花の無い葉状体の背面中肋上に不規則 2~3 列に、かたまって生ずる。油細胞は表皮、同化組織、基礎組織中に散布、油体は類円形、淡灰褐色、直徑 18~24 μ 、細胞内に充満する。和名は雌器托の形状に因む。

長野県南佐久郡北相木村、海拔 1040 m、粘板岩の基岩と、硬砂岩礫の露出する乾燥した南向斜面の岩隙～地上に生じ、附近にカラフトズミ、ミズナラ、フジ、ニシキギ、ウツギ、ノイバラ、ヤマブキ、キハギ、クサボタン等の灌木とオカトラノオ、カワラマツバ、センボンヤリ、アマドコロ、キジムシロ、オケラ、メドハギ、オトコヨモギ、ホタルブクロ、アヤメ、ヤマハツカ、オオヤマフスマ、

ゲンジスミレ等から成る群落が発達する。

9. グンバイゼニゴケ型 *A. glauco-virens* fo. *subsessilis*.

秩父山地で得た本種は基本種に比して、次の諸点の異同が見られる。この採集標本は充分な量ではあつたが、ただ一回の採集品であるため、これ等の相異点が遺伝的に固定した性質のものかどうかを決定するには弱く、今後本種の培養品の観察と、生育地に於ける再度の採集によつて、改めてこの問題を検討するとして、ここでは一応基本種の一型として扱つて置く。葉状体は小形、ロセツト状。孔辺細胞は孔に接する薄膜細胞が弱く肥厚（細い膜質の線だけのものあり）。腹鱗片はやや大形。包膜はほぼ球形、1~3個、雌器托柄は短かく 0.5 mm 以下、（表面の稜条は殆ど不明瞭）。胞子は暗褐色、直径 32~45~54 μ, 不顯著な翼部を形成すること多く、表面の疣状突起はやや低い。彈糸は淡褐色、長さ 60~120~200 μ, 太さ 6~14~20 μ, 4~5~(6) らせん糸を具へ、基本型同様表面に微小な屑様～疣状突起を散布する。油細胞は同化組織、基礎組織中（稀）に分布する。

埼玉県秩父郡大滝村、上中尾、海拔 700~800 m, 山地の乾燥した南向斜面の粘板岩～輝緑凝灰岩の岩隙～岩上～地上、又は雛段畠の石垣間等に生じ、附近にミヤマウラシロ、アカソ、ヤイトバナ、イノモトソウ、マルバマンネングサ、メボタンズル、ヒメウツギ、フクロシダ、コハコベ、スミレ、コナスピ、トラノオシダ、ヒメウラシロ、コガネシダ等から成る小規模な群落が発達する。

12. ヤツガタケデンチョウゴケ（新称）*Sauteria alpina* var. *japonica*.

雌雄同株、葉状体は厚く軟か、白緑色～淡緑色、体の長さ 10~15 mm, 巾 (3)~5~7 mm, 又状分枝はやや稀、先端は淺く切れ込み、中肋部の厚さは体の 1/4, 巾は 1/2 を占め、腹面はレンズ状に突出、気室は (2)~3 層、中形、気室孔は高く突出、古い葉状体では気室孔は腐朽して穴となり、孔辺細胞は 7 個、放射方向の細胞膜は不規則に弱く肥厚（細い膜質の線だけのものあり）、表皮細胞は肥厚せず、小さい葉綠粒を乏しく含む。腹鱗片は不規則 3~5~(6) 列、広隋円形、披針形の 2 型あり、無色、附屬物は 1 種に 2、基部のくびれはやや不明瞭、縁辺に乳頭状單細胞を生じ、油細胞は殆ど見えず、葉状体頂部に生ずる鱗片は背面に超出、反捲、乾燥すれば特に著しい。雌器托は葉状体の頂部に生じ、（葉状体先端の切れ込みの 2 裂片はその後も更に伸長をつづけることあり）、白緑色～淡緑色、直径 3~5 mm, 高さ 2~3 mm、ほぼ円形、上面は平坦、平滑で中央部は突出せず、気室を具へるが、気室孔は無い、表皮細胞は円く乳頭状にふくらむ。雌器托柄は殆ど無色、長さ 8~10~14 mm、表面に生ずる稜条はやや深く、仮根溝は 1、上部雌器托に接する部分に無色、長隋円形～披針形の鱗片（葉状に密着）あり、鱗片上部 1/3 の細胞は下部のものに比して大形、且つ膜が弱く、縁辺には乳頭状單細胞を生ずる。包膜は 1 雌器托上に 2~4~5 個、卵形、上端に短嘴様の小突起あり、開口部は 2 層状。胞子嚢は 1 雌器托に 1~4 個、黒褐色、熟すると包膜外に超出、4~5 片、花弁状に裂開する。胞子嚢の壁細胞には不規則らせん状の肥厚帶を具へ、胞子嚢柄は短かい。胞子は黒褐色～暗褐色、直径 60~72 μ, 翼を生ずるか又はこれを欠き、表面に乳頭状突起（1 直径線上に 7~8~9 個）を生じ、彈糸は淡黄色～淡黄褐色、長さ 160~200~220 μ, 太さ 14~17~20 μ, 4~5 らせん糸を具へる。雄器は葉状体の頂部、背面中肋上に雌花に接し又は雌花の無い葉状体の頂部に不規則に 3~4 列、かたまつて生ずる。油細胞は基礎組織中（稀）、雌器托柄上端に生ずる鱗片に生じ、油体は小粒の複合体で類円形、淡灰黃色、直径 36 μ. 和名は八ヶ嶽のデンチョウゴケの意。尙、属名は胞子嚢の裂開を沈丁花（瑞香）の花に見立てたもの。

長野県諏訪郡、八ヶ嶽、海拔 2500 m, 西～西南向の湿った集塊岩の崖面～岩隙に着生、附近の岩壁にシコタンハコベ、ミヤマオトヨモギ、イワベンケイソウ、ミヤマミミナグサ、イワツメクサ、チシマギキヨウ、ミヤマキンバイ、ウラゲムカゴトランオ、ミヤマウイキヨウ、クロクモソウ、タカネニガナ、タカネイ、タカネシダ、崖直下にミヤマアケボノソウ、ウスユキソウ、オノエリンドウ、メタカラコウ、ミソガワソウ、ヨツバシオガマ、ミヤマシオガマ、ヒトツバヨモギ、（ミヤマハンノキ）等から成る草本群落が発達する。

15. ヤツガタケゼニゴケ（新称）*Peltolepis quadrata* var. *japonica*.

雌雄同株、葉状体はやや厚く軟か、淡緑色、縁部は稀に淡紫色を帯び、腹面は淡緑色、体の長さ 10~20 mm, 巾 3~5 mm, 又状分枝は少く、先端は淺く 1~2 の切れ込みあり、中肋部の厚さは体の 1/2~1/3, 巾は 1/2~2/3 を占め、腹面にゆるく突出、気室は (1)~2~3 層、中形、気室孔は突出、孔辺細胞は (4)~(5)~6 個、1 列（栽培品には薄膜に区切られた 2 列のものあり）、膜は放射方向に著しく肥厚（星状肥厚）、表皮細胞は僅かに肥厚、角隅は小三角形、葉綠粒を含む。腹鱗片は不規則 3~4~(5) 列、卵形、無色～淡紫色、附屬物は大形で殆ど同大、長舌形、附屬物の境界は殆ど不明

瞭なるも僅かのくびれによつて識別され、縁辺の細胞は中央部に比して小形、細胞膜は時に弱く肥厚、縁辺に乳頭状細胞（ときには 2~4 細胞）を生ずる。雌器托は葉状体の頂端に生ずるが、先端切れ込みの 2 裂片はその後も伸長をつづけることが多く、而も屢々後方に向つて反転する性質を有する。托は淡緑色、直徑 4~5 mm、高さ 2~3 mm、ほぼ円形、上面は平坦、平滑で中央部は突出せず、小形の氣室を具へるが、氣室孔は無い、表皮細胞は円く乳頭状にふくらむ。雌器托柄は淡緑色~無色、長さ 5~14 mm、表面の稜条は浅く、仮根溝は 2、上部雌器托に接する部分に無色、稀に淡紫色、隋円形~広披針形の鱗片（葉状に密着）あり、細胞膜は時に弱く肥厚。包膜は 1 雌器托上に (2)~4~(6) 個、卵形、開口部は 2 層状。胞子嚢は 1 雌器托上に (1)~2~5 個、暗褐色、熟すれば包膜外は超出、先端より 4~5 片、花弁状に裂開する。壁細胞には環状~半環状の肥厚帯を具へ、胞子嚢柄は短かい。胞子は淡褐色~褐色、直徑 40~60~(70) μ 、表面に疣状突起 (1 直徑線上 (9)~10~11 個) を生じ、彈糸は淡黄褐色、長さ (160)~200~280 μ 、太さ 8~12~(16) μ 、3 らせん糸を具へる。雄器は雌花の後部、背面中肋上、又は雌花の無い葉状体の背面中肋部に隆起した托状部に群生、托状部は淡紫紅色の鱗片にかこまれる。油細胞は表皮に接する同化組織中に少く分布、腹鱗片には認められず、他の細胞に比し小形、油体は小粒の複合体で不規則な類円形、淡灰褐色、直徑 28~40 μ 。和名は八ヶ嶽産ぜにごけの意。

山梨県北巨摩郡、八ヶ嶽、海拔 2200~2300 m、南北に走る高山稜線の直下から東方に流下する小流畔の湿つた集塊岩の崖面~岩隙に着生、コメツガ、トウヒ、シラベ、(ダケカンバ) 針葉樹林帯の上限にあたり、附近の岩壁にタカネスイバ、ミヤマシヤジン、ミヤママンネングサ、ヒメシヤジン、クロクモソウ、ダイモンジソウ、イワオウギ、ヤマブキショウマ、イワツメクサ、カイフウロ、ヤハズヒゴタイ、ミヤマアキノキリンソウ、崖下にミソガワソウ、ヤグルマソウ、ミヤマメシダ、(ミヤマハンノキ) 等から成る草本群落が発達する。

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HEPATICAE JAPONICAE EXSICCATAE Ser. 1-6

Alphabetical list of species

By Sinske HATTORI

服部新佐：日本苔類標本 第 1~6 集

Acrobolbus diversilobus (Hatt.) Hatt., comb. nov. Syn. *Lophozia diversiloba* Hatt.¹⁾ (Jungermanniaceae) N. facing scree and ledges of limestone, 1850 m., Jūmonji Pass, Saitama Co., D.S. (Ser. 5, no. 224).

A. mayebarae (Hatt.) Hatt. On calcareous rocks in shade, 150 m., Isshoochi, Kumamoto Co., K.M. (Ser. 2, no. 66). Isotype!

Anastrepta orcadensis (Hook.) Schiffn. Humus among granitic rocks, 2940 m., nr. top of Kiso-koma, Nagano Co., D.S. (Ser. 5, no. 201).

Anastrophyllum mayebarae Hatt. Trunks and branches of *Cryptomeria japonica*, 750-900 m., Isl. Yakushima, Kagoshima Co., K.M. (Ser. 5, no. 202). Isotype!

Anthelia juratzkana (Limpr.) Trev. (Ptilidiaceae) On damp soil and crevices of graywacke in exposed places, Mt. Senjō, Nagano Co., D.S. (Ser. 6, no. 251).

Anthoceros formosae Steph. fo. *gemmulosus* Hatt. (Anthocerotaceae) On tuffy soil, 100 m., Obi, Miyazaki Co., S.H. (Ser. 2, no. 51).

A. laevis → *Phaeoceros laevis*!

A. miyabeanus Steph. Syn. *Aspiromitus miyabeanus* Steph. On tuffy bank, 100 m., Obi, Miyazaki Co., S.H. (Ser. 2, no. 55).

A. miyakeanus → *Phaeoceros miyakeanus*!

A. nagasakiensis Steph. On soil, 100 m., Obi, Miyazaki Co., S.H. (Ser. 2, no. 54).

Aspiromitus miyabeanus → *Anthoceros miyabeanus*!

Asterella chichibuensis Shim. et Hatt. (Rebouliaceae) On rock crevices and on soil in shade, 480 m., Otaki, Saitama Co., D.S. (Ser. 6, no. 252).

A. sanoana Shim. et Hatt. Wet chert cliff and base, 1280 m., by Chikuma River nr. Azusayama, Nagano Co., D.S. (Ser. 5, no. 203). Isotype!

Athalamia glauco-virens Shim. et Hatt. fo. *subsessilis* Shim. et Hatt. (Sauteiriaceae) Crevices of exposed cliffs of clay-slate, phillite and chert, 700 m., Otaki, Saitama Co., D.S. (Ser. 6, no. 253). Isotype!

Bazzania albicans Steph. (Lepidoziaceae) On tuffy bank, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 2).

B. fauriana (Steph.) Hatt. Forma ad *B. nodulosam* Horik. transiens. Sallow humus on granitic rocks, 1200 m., Isl. Yakushima, Kagoshima Co., T.A. (Ser. 6, no. 254).

B. fissifolia (Steph.) Steph. On granite, coniferous forest nr. summit of Sanpō, 2200 m., Saitama Co., D.S. (Ser. 5, no. 204); conglomerate beneath *Abies* forest, 2400 m., Mt. Yatsu, Nagano Co., D.S. (Ser. 5, no. 205).

B. fissifolia var. *subsimplex* (Steph. in sched.) Hatt. On siliceous bluff, 1900 m., Mt. Ogura, Nagano Co., D.S. (Ser. 6, no. 255).

1) Journ. Jap. Bot. 20: 265, fig. 48 (1944).

B. japonica (Sde. Lac.) Lindb. On tree trunks, 300 m., Kitagō, Miyazaki Co., S.H. (Ser. 1, no. 3); on shady damp sandstones and bases of trees, 550 m., Sakatani, Miyazaki Co., S.H. (Ser. 6, no. 256 -forma ad *B. flavo-virentem* Steph. transiens).

B. pompeana (Sde. Lac.) Mitt. On rocks, 200 m., Sakatani, Miyazaki Co., S.H. (Ser. 1, no. 4).

B. trigona Hatt. On wet rocky ledges, 1000 m., Mt. Kyōgadake, Nagasaki Co., Y.K. (Ser. 6, no. 527).

B. yakushimensis Horik. On moist granitic rocks, 700 m., Isl. Yakushima, Kagoshima Co., T.A. (Ser. 4, no. 151). Loc. orig.!

B. yoshinagana (Steph.) Hatt. Syn. *B. platyphylla* Hatt. On granitic cliffs, 1800 m., Isl. Yakushima, Kagoshima Co., T.A. (Ser. 4, no. 152).

Blasia pusilla L. (Blasiaceae) On tuffy bank, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 31).

Blepharostoma minus Horik. (sphalm. *minor*) Syn. *B. trichophyllum* Auct., quoad plant. Japon. p. maj. parte. *B. japonicum* Hatt. et Kuwahara, sine diagn. Lat. (Ptilidiaceae) On tuffy bank, 100 m., Obi, Miyazaki Co., S.H. (Ser. 2, no. 57), as *Bl. trichophyllum*.

Bl. trichophyllum → *Bl. minus*!

Brachiolejeunea sandvicensis (Gott.) Evs. (Lejeuneaceae) On barks, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 20).

Calobryum rotundifolium (Mitt.) Schiffn. (Haplomitriaceae) On tuffy ledges in shade, 20 m., Obi, Miyazaki Co., S.H. (Ser. 3, no. 101).

Calypogeia integristipula → *C. neesiana*!

Calypogeia neesiana (Mass. et Carest.) K. Müll. Syn. *C. integristipula* Steph. (Calypgiaceae) Soil beneath woods, n. slope of Mt. Kujū, 1400 m., Oita Co., T.O. (Ser. 5, no. 206).

C. tosana Steph. On rotten logs, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 6).

Cephalozia dubia → *C. otaruensis*!

Cephalozia lammersiana var. *innovata* Amakawa (Cephaloziaceae) Wet soil among agglomerate ledges, 2100 m., Natsuzawa Pass, Nagano Co., D.S. (Ser. 6, no. 259).

C. mayebarae → *Acrobolbus mayebarae*!

C. nipponica Hatt. Decaying wood, 1200 m., Mt. Kirishima, Miyazaki Co., T.A. (Ser. 4, no. 153).

C. otaruensis Steph. Syn. *C. dubia* Hatt. Decayed wood in shade, 500 m., Miyazaki Co., S.H. & T.K. (Ser. 2, no. 65).

C. otaruensis var. *acrogyna* Amakawa On damp rocks beneath woods, n. slope of Mt. Kujū, 1400 m., Oita Co., T.O. (Ser. 6, no. 260).

Cephaloziella godajensis (Steph.) Hatt. Banks in woods, 150 m., Hitoyoshi, K.M. (Ser. 4, no. 154).

C. recurvisolia (Steph.) Hatt. Wet rocks, 550 m., Uemura, Kumamoto Co., K.M. (Ser. 4, no. 155); wet and often submerged rocks, Sono, Aichi Co., N.T. (Ser. 5, no. 207); wet or dripping rocks, 600 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 5, no. 208).

Chandonanthus birmensis → *Tennuma birmense*!

Chiastocaulon dendroides (Nees) Carl (Plagiochilaceae) Tree trunks and bases,

1150 m., Mt. Kirishima, Kagoshima Co., S.H. (Ser. 4, no. 156).

Chiloscyphus polyanthus (L.) Cda. (Harpantaceae) On submerged rocks, 400 m., Nakagō, Miyazaki Co., S.H. (Ser. 2, no. 61); submerged in stream, 200 m., Ichibu, Kumamoto Co., K.M. (Ser. 2, no. 62).

Cololejeunea minutula (Mitt.) Steph. (Lejeuneaceae) On moist boulders beneath woods, 500 m., Sakatani, S.H. & T.K. (Ser. 2, no. 79), on leaves of evergreens, 500 m., Nakagō, Miyazaki Co., S.H. (Ser. 4, no. 157).

C. orbiculata (Herz.) Hatt. Branches of *Rhododendron lateritium*, 20 m., Obi, Miyazaki Co., S.H. (Ser. 3, no. 131).

C. rupicola Steph. Decaying wood, 500 m., Mt. Mukabaki, Miyazaki Co., T.A. (Ser. 5, no. 209).

C. shikokiana (Horik.) Hatt. On trees, 100 m., Fukada, Kumamoto Co., K.M. (Ser. 3, no. 132).

C. spinosa (Horik.) Hatt. On leaves of ferns, etc., 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 21).

Conocephalum conicum (L.) Dum. (Marchantiaceae) On shady earth, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 35).

C. supradecompositum (Lindb.) Steph. On shady gound, 20 m., Obi, Miyazaki Co., S.H. (Ser. 3, no. 148); do., 100 m., S.H. (Ser. 1, no. 36); do., on walls, S.H. (Ser. 1, no. 37). No. 36 with female receptacles and sporangia, no. 37 with male receptacles (disk), and no. 148 with ample gemmae.

Diplophyllum albicans (L.) Dum. (Scapaniaceae) Rocky ledges, 16-1700 m., Mt. Ichifusa, Kumamoto Co., K.M. (Ser. 3, no. 114).

D. serratum (K. Müll.) Steph. On banks, 100 m., Nishinomura, Kumamoto Co., K.M. (Ser. 4, no. 158).

Drepanolejeunea foliicola Horik. (Lejeuneaceae) On living leaves of *Ilex latifolia*, 200 m. alt., Sakatani, Miyazaki Co., S.H. (Ser. 6, no. 261); on living leaves of evergreens, 300 m., Kitagō, Miyazaki Co., S.H. (Ser. 1, no. 22).

D. japonica Horik. On shaded boulders, 500 m., Sakatani, Miyazaki Co., S.H. & T.K. (Ser. 2, no. 80); on barks of *Pinus thunbergii*, 450 m., Nakagō, Miyazaki Co., S.H. (Ser. 2, no. 81).

Dumontiera hiroshima Burgeff Syn. *D. hirsuta* Auct. -quoad plant. Japon.; *D. nepalensis* Auct. -quoad plant. Japon.; *D. nipponica* Hatt., etc. (Marchantiaceae) Shaded, damp ledges, 20 m., Obi, Miyazaki Co., S.H. & D.S. (Ser. 5, no. 210), do., 100 m., semishaded rocks, S.H. (Ser. 1, no. 38).

D. nepalensis → *D. hiroshima*!

Euosmolejeunea auriculata Steph. (Lejeuneaceae) Creeping on mosses and small ferns (*Hymenophyllum*), 250 m., Isshoochi, Kumamoto Co., K.M. (Ser. 3, no. 133).

E. obtusifolia (Steph.) Hatt. On shaded damp stone-walls, 1100 m., Mt. Hikosan, Fukuoka Co., Y.K. (Ser. 6, no. 262).

Fossmobronia japonica Schiffn. (Fossmobroniaceae) On earth, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 30).

Frullania densiloba Steph. (Frullaniaceae) On trees, 700 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 3, no. 124).

Fr. diversitexta Steph. On barks, 400 m., Sakatani, Miyazaki Co., S.H. (Ser. 1, no. 26).

Fr. mayebarae Hatt. On rocks often wet or submerged, sides of River Kuma, Ohno, Kumamoto Co., K.M. (Ser. 3, no. 125). Isotype!

Fr. moniliata subsp. *obscura* Verd. On shaded rocks, 400 m., Nakagō, Miyazaki Co., S.H. & T.K. (Ser. 2, no. 88); pendulous on rocks, subphotophilous, 400 m., Kitagō, Miyazaki Co., S.H. & T.K. (Ser. 2, no. 87).

Fr. motoyana Steph. On barks of *Chamaecyparis obtusa*, Hitoyoshi, Kumamoto Co., K.M. (Ser. 3, no. 126); on barks of *Pinus densiflora*, 400 m., Koonose, Kumamoto Co., K.M. (Ser. 6, no. 263).

Fr. muscicola Steph. On barks of *Pinus densiflora*, 500 m., Mt. Terukaku, Kumamoto Co., K.M. (Ser. 3, no. 127).

Fr. nepalensis (Sprengel) Lehm. et Lindenb. On chert, nr. summit of Azusa-shiroiwa, 1700 m., Saitama Co., D.S. (Ser. 5, no. 211).

Fr. nodulosa (R.B.N.) N. var. *nipponica* Hatt. et Kamim. On rocks, Amatsubo, Kochi Co., M.K. (Ser. 3, no. 128). From the type locality!

Fr. ontakensis → *Fr. schensiana*!

Fr. parvistipula Steph. On tree trunks, Hitoyoshi, Kumamoto Co., K.M. (Ser. 2, no. 89),

Fr. pedicellata Steph. On rocky ledges, 200 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 27).

Fr. sackawana Steph. On bases of *Pinus densiflora*, subphotophilous, Sakawa, Kōchi Co., M.K. (Ser. 2, no. 90). From the type locality!

Fr. schensiana Mass. Syn. *Fr. ontakensis* Steph. On barks of *Pinus densiflora*, 400 m., Koonose, Kumamoto Co., K.M. (Ser. 3, no. 129).

Fr. squarrosa (R., Bl. et N.) Dum. On barks, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 28).

Fr. taradakensis Steph. On calcareous rocks, 800 m., Mt. Kosho, Fukuoka Co., Y.K. (Ser. 6, no. 264).

Fr. truncatifolia Steph. On barks, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 29).

Gymnocolea montana (Horikawa) Hatt. (Jungermanniaceae) Wet soil of marsh, 1650 m., Mt. Kujū, Y.K. (Ser. 4, no. 159); wet rocks or submerged, 1700 m., Mt. Kujū, Oita Co., T.O. (Ser. 5, no. 212). Mt. Kujū is the original locality.

Gymnomitrium brevilobum (Steph.) Hatt. (Marsupellaceae) Granitic rocks, 2930 m., nr. top of Kiso-koma, Nagano Co., D.S. (Ser. 5, no. 213); agglomerates, 2500 m., Natsuzawa Pass, Nagano Co., D.S. (Ser. 5, no. 214).

G. faurianum (Steph.) Herz. Granitic rocks, 2970 m., top of Kiso-koma, Nagano Co., D.S. (Ser. 5, no. 215).

G. noguchianum Hatt. Agglomerates, 1400 m., Mt. Kujū, Oita Co., T.A. (Ser. 5, no. 216). From the original locality.

G. revolutum (Nees) Philibert Granite, 2960 m., top of Kiso-koma, Nagano Co., D.S. (Ser. 5, no. 217).

Harpalejeunea intermedia Evans. (Lejeuneaceae) On barks of *Cryptomeria japonica*, 100 m., Obi, Miyazaki Co., S.H. & T.K. (Ser. 2, no. 82).

Herberta longifissa (Steph.) Steph. (Herbertaceae) On granitic bluffs, 1800 m.,

Isl. Yakushima, Kagoshima Co., *T.A.* (Ser. 4, no. 160); granitic ledges, 2300 m., n. slope of Hafu, Saitama Co., *D.S.* (Ser. 5, no. 218); granite, 2930 m., nr. top of Kiso-koma, Nagano Co., *D.S.* (Ser. 5, no. 219); agglomerates, 2600 m., Mt. Yatsu, Nagano Co., *D.S.* (Ser. 5, no. 220).

H. sakuraii (Warnst.) Hatt. Granitic bluffs, 1700 m., Mt. Ichifusa, Kumamoto Co., *K.M.* (Ser. 4, no. 162); tree trunks and bases, 1600 m., Isl. Yakushima, Kagoshima Co., *T.A.* (Ser. 4, no. 161).

Heteroscyphus argutus (R.B.N.) N. fo. *aquatica* Hatt. (aquatic form) (Harpanthaceae) Submerged in pond, 20 m., Obi, Miyazaki Co., *S.H.* (Ser. 3, no. 109).

H. bescherellei (Steph.) Hatt. On shaded moist rocks, 400 m., Sakatani, Miyazaki Co., *S.H.* (Ser. 1, no. 11).

H. bescherellei var. *transiens* Hatt. Damp sandstone ledges, 500 m., Sakatani, Miyazaki Co., *S.H.* (Ser. 6, no. 265).

H. planus (Mitt.) Schiffn. Moist rocks, 100 m., Obi, Miyazaki Co., *S.H.* (Ser. 1, no. 12).

Isotachis japonica Steph. (Ptilidiaceae) Wet soil, 1400 m., Isl. Yakushima, Kagoshima Co., *T.A.* (Ser. 4, no. 164); do., wet or moist rocks of granite, 1300 m., *T.A.* (Ser. 4, no. 165); do., moist or wet granite, 700 m., *K.M.* (Ser. 4, no. 163). From the type locality!

Jackiella brunnea (Horik.) Hatt. (Possibly identical with *J. javanica* Schiffn.) (Jungermanniaceae) Rocky ledges, 200 m., Isshoochi, Kumamoto Co., *K.M.* (Ser. 4, no. 166).

Jamesoniella autumnalis var. *nipponica* (Hatt.) Hatt. On granite, 800 m., Mt. Ichifusa, Kumamoto Co., *K.M.* (Ser. 4, no. 167).

Jubula hutchinsiae subsp. *japonica* (Steph.) Hatt. Syn. *Jubula japonica* Steph. (Frullaniaceae) On rotten logs in shade, 500 m., Sakatani, Miyazaki Co., *S.H.* (Ser. 2, no. 91); do., shady, damp ledges of graywacke, 520 m., *S.H.* (Ser. 6, no. 266).

J. hutchinsiae subsp. *javanica* (Steph.) Verd. Moist rocks, 150 m., Agata, Miyazaki Co., *S.H.* & *T.K.* (Ser. 3, no. 130).

J. japonica → *J. hutchinsiae* subsp. *japonica*!

Jungermannia fauriana → *Solenostoma decurrens*!

J. hiugaensis → *Solenostoma hiugaense*!

J. senjoensis → *Solenostoma senjoense*!

J. tristis → *Solenostoma tristis*!

Lejeunea aquatica Horik. (Lejeuneaceae) In spring, Nishinomura, Kumamoto Co., *K.M.* (Ser. 3, no. 134).

L. flava (Sw.) N. Barks of *Cryptomeria japonica*, 30 m., Obi, Miyazaki Co., *S.H.* (Ser. 3, no. 135).

L. japonica Mitt. Syn. *L. nipponica* Hatt. On rocks, Hitoyoshi, Kumamoto Co., *K.M.* (Ser. 2, no. 83).

L. nipponica → *L. japonica*!

L. pallide-virens Hatt. (nom. nov.) Syn. *Microlejeunea rotundistipula* var. *pallida* Hatt. On rocks, subphotophilous, 100 m., Obi, Miyazaki Co., *S.H.* & *T.K.* (Ser. 2, no. 84).

L. scalaris (Steph.) Hatt. Moist loamy or sandy banks, 30 m., Obi, Miyazaki Co., *S.H.* & *T.K.* (Ser. 3, no. 136). This species may be closely related to or

conspecific with *L. japonica* Mitt.

L. vaginata Steph. On trees, Mt. Yatake, Kumamoto Co., K.M. (Ser. 3, no. 137). This species is closely related to or possibly conspecific with *L. nietneri* Steph.

Lepidozia fauriana Steph. Forma ad *L. vitrea* Steph. transiens. (Lepidoziaceae) Moist or wet rocks, 500 m., Koonose, Kumamoto Co., K.M. (Ser. 4, no. 169).

L. subtransversa Steph. Rocks and soil, 2300 m., Mt. Ontake, Nagano Co., S.H. (Ser. 6, no. 269); moist granitic ledges, 900 m., Isl. Yakushima, Kagoshima Co., K.M. (Ser. 4, no. 170).

L. vitrea Steph. On decaying wood in shade, 500 m., Nakagō, Miyazaki Co., S.H. (Ser. 1, no. 5.).

Leptocolea ciliatilobula Horik. (Lejeuneaceae) On leaves of evergreens and ferns, 20 m., Obi, Miyazaki Co., S.H. & D.S. (Ser. 5, no. 223).

L. dolichostyla Herz. On leaves, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 23).

L. japonica Schiffn. Moist rocks, 100 m., Isshoochi, Kumamoto Co., K.M. (Ser. 3, no. 138).

L. lanciloba (Steph.) Evans. On leaves of broad-leaved evergreens, 400 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 6, no. 270).

Leptolojeunea subacuta Steph. On leaves, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 24).

Lophocolea heterophylla (Schrad.) Dum. (Harpanthaceae) On decaying wood, 600 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 6, no. 271).

L. horikawana Hatt. Rocks in forest, 700 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 3, no. 110).

L. minor N. Shady banks and rotten wood, 250 m., Obi, Miyazaki Co., S.H. (Ser. 3, no. 111).

Lopholejeunea formosana → *L. subfuscata*!

Lopholejeunea subfuscata (Nees) Steph. Syn. *L. formosae* Horik. (Lejeuneaceae) On trees, 700 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 3, no. 139).

Lophozia cornuta (Steph.) Hatt. (Jungermanniaceae) On decaying wood, 800 m., Mt. Hikosan, Fukuoka Co., Y.K. (Ser. 6, no. 272).

L. diversiloba → *Acrobolbus diversilobus*!

L. fauriana Steph. On decaying wood beneath coniferous forest, 1600 m., Hirayu, Gifu Co., S.H. (Ser. 6, no. 273).

L. incisa (Schrad.) Dum. Damp agglomerates beneath woods, 1350 m., Mt. Daisen, Oita Co., T.O. (Ser. 5, no. 225).

Macrodiplphyllum plicatum (Lindb.) Perss. (Scapaniaceae) Shallow humus among agglomerates, 2600 m., Mt. Yatsu, Nagano Co., D.S. (Ser. 5, no. 226); do., agglomerates in rather exposed places, 2400 m., D.S. (Ser. 5, no. 227); shallow humus among granite, 2950 m., top of Kiso-koma, Nagano Co., D.S. (Ser. 5, no. 228).

Makinoa crispata (Steph.) Miyake (Makinoaceae) On soil, in shade, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 32).

Mannia barbifrons Shim. & Hatt. (Rebouliaceae) Crevices of stone-walls in exposed places, 300 m. alt., Tomiyama, Aichi Co., N.T. (Ser. 6, no. 274).

Marchantia cuneiloba Steph. (Marchantiaceae) On rocks, meso- sciophilous, 100 m., Obi, Miyazaki Co., S.H. (Ser. 2, no. 97); do., on tuffy cliff in shade, 100 m.,

S.H. (Ser. 2, no. 98); do., on shady rocks, *S.H.* (Ser. 1, no. 39). No. 39 with female receptacles; no. 98 with male ones; no. 97 with cupules.

M. diptera Mont. On rocks, 100 m., Obi, Miyazaki Co., *S.H.* (Ser. 1, no. 40). Female plants with receptacles.

M. polymorpha L. On ground and in ditches, Niigata, Niigata Co., *Y.I.* (Ser. 3, no. 149). Fertile plants.

M. tosana Steph. On rocks, subphotophilous, 100 m., Obi, Miyazaki Co., *S.H.* (Ser. 1, no. 41); do., *S.H.* (Ser. 1, no. 42). No. 41 with female receptacles; no. 42 with male ones.

Marsupella parvitexta Steph. (Marsupellaceae) Granitic bluffs, 1100 m., Mt. Ichifusa, *K.M.* (Ser. 4, no. 171); on rocks, 1200 m. alt., *Fagus crenata* forest, Mt. Hikosan, Fukuoka Co., *Y.K.* (Ser. 6, no. 275).

M. pseudofunckii Hatt. Shady and moist rocks, 700 m., Hitoyoshi, Kumamoto Co., *K.M.* (Ser. 3, no. 118). Original material.

M. tubulosa Steph. fo. *rubidula* Hatt. Exposed surface of granite, 1600 m., Isl. Yakushima, Kagoshima Co., *T.A.* (Ser. 4, no. 172).

M. yakushimensis (Horik.) Hatt. Wet ledges of granite, 1300 m., Isl. Yakushima, Kagoshima Co., *K.M.* (Ser. 4, no. 173); do., moist granite, 1400 m., *T.A.* (Ser. 4, no. 174).

Mastigolejeunea liukiensis var. *mayebarae* Hatt. Syn. *M. mayebarae* Hatt., msc. (Lejeuneaceae) Calcareous rocks and branches of trees and shrubs, 300 m., Isshoochi, Kumamoto Co., *K.M.* (Ser. 3, no. 140). Isotype!

M. mayebarae → *M. liukiensis* var. *mayebarae*!

Mastigophora diclados (Brid.) N. (Ptilidiaceae) On tree trunks, 760 m., Isl. Yakushima, Kagoshima Co., *D.S.* (Ser. 6, no. 276).

Megaceros tosanus Steph. (Anthocerotaceae) Wet stones in stream, 400 m., Nakagō, Miyazaki Co., *S.H.* (Ser. 3, no. 150).

Metzgeria hamata Lindb. (Metzgeriaceae) Rocks, 800 m., Mizukami, Kumamoto Co., *K.M.* (Ser. 4, no. 175).

M. himalayensis Kashyap (a form) On shaded, damp rocks, 300 m., Kitagō, Miyazaki Co., *S.H.* & *T.K.* (Ser. 2, no. 93).

Microlejeunea punctiformis (Tayl.) Spr. (Lejeuneaceae) Barks of *Cryptomeria japonica*, 400 m., Nakagō, Miyazaki Co., *S.H.* (Ser. 3, no. 141).

M. rotundistipula var. *pallida* → *Lejeunea pallide-virens*!

Microlepidozia makinoana (Steph.) Hatt. On tuffy cliffs, 20 m., Obi, Miyazaki Co., *S.H.* (Ser. 3, no. 107); on thin soil of cliff, 700 m., Mt. Unzen, Nagasaki Co., *Y.K.* (Ser. 6, no. 258).

Monoselenium tenerum Griffith Syn. *Dumortieropsis liukiensis* Horik. (Marchantiaceae) Shady soil, 100 m., Obi, *S.H.* (Ser. 1, no. 43).

Mylia taylori (Hook.) Bernet et Gray (Jungermanniaceae) Chert, top of Ryōgami, 1680 m., Saitama Co., *D.S.* (Ser. 5, no. 229); granitic rocks, 2000 m., Karisaka Pass, Saitama Co., *D.S.* (Ser. 5, no. 230).

M. verrucosa Lindb. On rocks, Sumino, Ehime Co., *K.O.* (Ser. 2, no. 58).

Nardia grandistipula Steph. On tuffy bank, 300 m., subphotophilous, Sakatani, Miyazaki Co., *S.H.* & *T.K.* (Ser. 2, no. 59).

N. parvifolia (Steph.) Hatt. Syn. *Alobiella parvifolia* Steph. Bank, 300 m.,

Hitoyoshi, Kumamoto Co., *K.M.* (Ser. 5, no. 231).

Neotrichocolea bisseti (Mitt.) Hatt. (Ptilidiaceae) Wet rocks in shade, 750 m., Mizukami, Kumamoto Co., *K.M.* (Ser. 3, no. 105); wet rocks in dense forest, 1200 m., Mt. Odaigahara, Nara Co., *N.T.* (Ser. 3, no. 104).

Nipponolejeunea pilifera (Steph.) Hatt. (Lejeuneaceae) Rocks and bases of trees and shrubs, 16–1700 m., Mt. Ichifusa, Kumamoto Co., *K.M.* (Ser. 3, no. 142); On barks of trees, 1050 m., Mt. Unzen, Nagasaki Co., *Y.K.* (Ser. 6, no. 277).

*Noguchia*²⁾ Hatt., nom. nov. Syn. *Plagiochilion* Hatt³⁾. (Plagiochilaceae) *N. mayebarae* Hatt., comb. nov. Syn. *Plagiochilion mayebarae* Hatt⁴⁾. On trunks and bases of *Fagus crenata*, 1700 m., Mt. Ichifusa, Kumamoto Co., *K.M.* (Ser. 4, no. 184). From the type locality!

Notothylas japonica Horik. (Anthocerotaceae) On soil, 100 m., Obi, Miyazaki Co., *S.H.* (Ser. 2, no. 56).

Novellia curvifolia (Dicks.) Mitt. (Cephaloziaceae) On rotten logs, 400 m., Sakatani, Miyazaki Co., *S.H.* (Ser. 1, no. 17).

Odontoschisma cavifolium → *O. demudatum*!

Odontoschisma demudatum (L.) Dum. Syn. *O. cavifolium* Steph. On rotten logs in shade, 500 m., Sakatani, Miyazaki Co., *S.H.* (Ser. 2, no. 67); do., damp rotten logs, subphotophilous, 400 m., *S.H.* & *T.K.* (Ser. 2, no. 68). No. 68 with abundant gemmae.

O. grosseverrucosum Steph. Shady rocks, 700 m., Hitoyoshi, Kumamoto Co., *K.M.* (Ser. 3, no. 108).

O. grosseverrucosum var. *lutescens* (Hatt.) Hatt. Syn. *O. lutescens* Hatt. Granitic ledges, moist and often wet, 200 m., Isl. Yakushima, Kagoshima Co., *K.M.* (Ser. 4, no. 176). From the type locality!

Orthocaulis attenuatus (Mart.) Evs. Syn. *Lophozia trifida* Steph. (Jungermanniaceae) Earthy ledge, *Abies* forest, 2400 m., Mt. Yatsu, Nagano Co., *D.S.* (Ser. 5, no. 232).

Pallavicinia longispina Steph. (Pallaviciniaceae) Shaded soil, sciophilous, 100 m., Obi, Miyazaki Co., *S.H.* (Ser. 1, no. 33).

Pellia fabbroniana Raddi (Pelliaceae) Wet rocks, 500 m., Sakatani, Miyazaki Co., *S.H.* (Ser. 2, no. 92).

Peltolepis quadrata var. *japonica* Shim. et Hatt. (Sauteriaceae) Among rock crevices and damp surfaces of agglomerate cliffs, 2280 m., Mt. Yatsu, Nagano Co., *D.S.* (Ser. 6, no. 278). Isotype!

Phaeoceros laevis (L.) Proskauer Syn. *Anthoceros laevis* L. (Anthocerotaceae) On soil, mesophilous, 100 m., Obi, Miyazaki Co., *S.H.* (Ser. 2, no. 52).

Ph. miyakeanus (Schiffn.) Hatt., comb. nov. Syn. *Anthoceros miyakeanus* Schiffn⁵⁾. On soil, mesophilous, 100 m., Obi, Miyazaki Co., *S.H.* (Ser. 2, no. 53).

Plagiochasma intermedium Lindnb. et Gott. (Rebouliaceae) Crevices of calcareous ledges, Koonose, Kumamoto Co., *K.M.* (Ser. 2, no. 99); on rocky cliff (not of limestone) in shade, 240 m., Isshoichi, Kumamoto Co., *K.M.* (Ser. 6, no. 279).

2) Named in honor of Dr. A. NOGUCHI, an eminent bryologist in Japan, who is the senior editor of "Musci Japonici Exsiccati".

3) Biosphaera, 1: 4 & 7 (1947).

4) Journ. Hattori Bot. Lab. 3: 39, fig. 34 (1950).

5) Österr. Bot. Zeitschr. 49: 391 (1899).

Plagiochila dentosa (Hatt.) Hatt., stat. nov. Syn. *Pl. hakkodensis* Steph. var. *dentosa* Hatt.⁶⁾ (Plagiochilaceae) On granitic rocks, 2380 m., coniferous forest, Sanpōzan of Chichibu Mts., Saitama Co., D.S. (Ser. 6, no. 281).

Pl. fruticosa Mitt. On rocky ledges, 200 m., Sakatani, Miyazaki Co., S.H. (Ser. 1, no. 13).

Pl. furcifolia Mitt. On banks and stone-walls, 100–170 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 4, no. 177); on tree trunks and bases, woods of Dazaifu Shrine, 40 m., Fukuoka Co., Y.K. (Ser. 6, no. 280).

Pl. hakkodensis Steph. On moist agglomerate ledges, 2600 m., Mt. Yatsu, Nagano Co., D.S. (Ser. 6, no. 282).

Pl. japonica Sde. Lac. On rocks, 300 m., Kitagō, Miyazaki Co., S.H. (Ser. 1, no. 14).

Pl. japonica fo. *fragilis* Hatt. Rocks, 100 m., Ishoochi, Kumamoto Co., K.M. (Ser. 4, no. 178).

Pl. ovalifolia Mitt. On shaded rocks, 300 m., Kitagō, Miyazaki Co., S.H. (Ser. 1, no. 15); on rocks, Kanazu, Niigata Co., Y.I. (Ser. 2, no. 63 -forma ad *Pl. hakkodensem* ± transiens).

Pl. pulcherrimum Horik. On tree trunks, 600 m., Isl. Yakushima, Kagoshima Co., T.A. (Ser. 4, no. 179); rock ledges, 600 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 5, no. 233).

Pl. rhizophora Hatt. On damp sandy substrata (weathered graywacke), 1800 m., Mikuni Pass, Saitama Co., D.S. (Ser. 6, no. 283).

Pl. satoi Hatt. var. *integerrima* Hatt., var. nov.⁷⁾ On moist rocky ledges, 2300 m., Mt. Kobushi, Saitama Co., D.S. (Ser. 6, no. 284). Isotype!

Pl. semidecurrans var. *grossidens* Herz. Moist rocks (granite), 700 m., Isl. Yakushima, Kagoshima Co., T.A. (Ser. 4, no. 180).

Pl. shimizuana Hatt.⁸⁾ On clay-slate bluff, 3100 m., nr. summit of Mt. Kitadake, Yamanashi Co., D.S. (Ser. 6, no. 285). Isotype!

Pl. trabeculata Steph. On tree trunks in dense woods, 700 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 4, no. 182).

Pl. yokogurensis Steph. On barks, 300 m., Kitagō, Miyazaki Co., S.H. (Ser. 1, no. 16); on stone-wall, Yatsushiro, Kumamoto Co., K.M. (Ser. 3, no. 113); semishaded rocks (chert), 300 m., Kagemori, Saitama Co., D.S. & S.H. (Ser. 4, no. 181); limestone, 500 m., Shiiba, Miyazaki Co., T.A. (Ser. 5, no. 234).

Pl. yuwandakensis var. *grossedentata* Hatt. Rotten log in woods, 1200 m., Isl. Yakushima, Kagoshima Co., T.A. (Ser. 4, no. 183). From the type locality.

Plagiochilion mayebarae → *Noguchia mayebarae*!

Plectocolea comata (Nees) Hatt. (Jungermanniaceae) On tuffy bank, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 7); thin humus of bank, 500 m., Isl. Yakushima, Kagoshima Co., Y.K. (Ser. 5, no. 235). No. 235 is "*Nardia granulata*" of Stephani (1897).

Pl. infusca Mitt. Syn. *Pl. ovicalyx* Hatt., Hepat. Japon. nec Stephani. On

6) Journ. Jap. Bot. 25: 139, fig. 56 (1950).

7) A typo differt foliis fere integerrimis vel rarius paudentatis.

8) This species may be closely related to *Pl. semidecurrans* var. *grossidens* Herz., but its leaves are less dentate. The description will be published later.

tuffy cliff, 100 m., Obi, Miyazaki, S.H. (Ser. 1, no. 8), as *Pl. ovicalyx*; semishaded rocks, Fuka-yabakei, Oita Co., A.N. (Ser. 4, no. 185), as *Pl. ovicalyx*.

Pl. ovicalyx (Steph.) Hatt. Agglomerate, 2500 m., Natsuzawa Pass, Nagano Co., D.S. (Ser. 5, no. 236). Also see, *Pl. infusca*!

Pl. radicellosa Mitt. On soil, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 9). Small.

Pl. rubripunctata Hatt. On exposed tuff bluff, 300 m., Nakagō, Miyazaki Co., S.H. (Ser. 2, no. 60). Paratype!

Pl. virgata Mitt. On boulders in shade, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 10); shaded rocks, Fuka-yabakei, Oita Co., A.N. (Ser. 4, no. 186).

Pl. yakusimensis Hatt. On wet granite, 700 m., Isl. Yakushima, Kagoshima Co., K.M. (Ser. 4, no. 187). From the type locality.

Pleurozia giganteoides Horikawa (Pleuroziaceae) On branches of *Rhododendron yakushimanum*, 1600 m., Isl. Yakushima, Kagoshima Co., T.A. (Ser. 4, no. 188). From the type locality.

Porella densifolia (Steph.) Hatt. (Porellaceae) On calcareous rocks, Oono, Kumamoto Co., K.M. (Ser. 2, no. 73); calcareous rocks, 300 m., Isshoichi, Kumamoto Co., K.M. (Ser. 5, no. 237).

P. gracillima Mitt. On limestone ledges, 1620 m., summit of Mt. Shiroiwa, Miyazaki Co., S.H. (Ser. 6, no. 286).

P. grandiloba Lindb. Syn. *P. parvistipula* (Steph.) Hatt. On damp ledges of chert, 1360 m., Mt. Ogura in Minami-saku, Nagano Co., D.S. (Ser. 6, no. 287); shaded damp limestone ledges, 1300 m., *Quercus crispula* forest, Miwa, Nagano Co., N.T. (Ser. 5, no. 238), as *P. parvistipula*; on chert, 1150 m., Mt. Ryōgami, Saitama Co., D.S. (Ser. 5, no. 239), as *P. parvistipula*.

P. japonica (Sde. Lac.) Mitt. Bases of trees, 500 m., Sakatani, Miyazaki Co., S.H. (Ser. 2, no. 74).

P. parvistipula → *P. grandiloba*!

P. perrottetiana (Mont.) Hatt. On barks, 400 m., Sakatani, Miyazaki Co., S.H. (Ser. 1, no. 19); on damp rocks in shade, Mt. Hikosan, Fukuoka Co., Y.K. (Ser. 6, no. 288).

P. setigera (Steph.) Hatt. Syn. *P. setigera* var. *cordifolia* (Steph.) Hatt.; *Madotheca cordifolia* Steph. Semishaded ledges of chert, 300 m., Kagemori, Saitama Co., D.S. & S.H. (Ser. 4, no. 189); tree trunk, 800 m., Mt. Hikosan, Fukuoka Co., Y.K. (Ser. 5, no. 240); calcareous rocks, 150 m., Koonose, Kumamoto Co., K.M. (Ser. 3, no. 122), as *P. setigera* var. *cordifolia*.

P. setigera var. *cordifolia* → *P. setigera*!

P. stephaniana (Mass.) Hatt. Calcareous rocks, 150 m., Koonose, Kumamoto Co., K.M. (Ser. 3, no. 123).

P. takakii Hatt. Shaded damp limestone ledge, *Quercus crispula* woods, 1300 m., Miwa, Nagano Co., N.T. (Ser. 5, no. 241); bases of trees, 1100 m., e. slope of Mt. Shiroiwa, Miyazaki Co., S.H. (Ser. 6, no. 289). No. 241 is isotype!

P. tosana (Steph.) Hatt. Bases of trees, 500 m., Sakatani, Miyazaki Co., S.H. & T.K. (Ser. 2, no. 75); on shaded rocks, 400 m., Kitagō, Miyazaki Co., S.H. & T.K. (Ser. 2, no. 76).

P. ulophylla (Steph.) Hatt. On tree trunks, meso-xerophilous, 100 m., Obi,

Miyazaki Co., S.H. (Ser. 2, no. 77).

P. vernicosa Lindb. On tree trunks, Hitoyoshi, Kumamoto Co., K.M. (Ser. 2, no. 78).

Preissia quadrata (Scopoli) Nees (Marchantiaceae) Damp ledges of limestone and chert in woods, 1850 m., n. slope of Jumonji Pass, Saitama Co., D.S. (Ser. 5, no. 242).

Ptilidium californicum Aust. var. *multispinum* Hatt. var. nov⁹⁾. (Ptilidiaceae) On barks of *Pinus pumila*, 2700 m., Mt. Asayo of S. Alps, Yamanashi Co., D.S. (Ser. 6, no. 290). Isotype!

Pt. pulcherrimum (Web.) Hampe Barks of deciduous trees and conifers, 1600 m., Mt. Norikura, S.H. (Ser. 4, no. 190); barks of *Pinus pumila*, 2640 m., Mt. Yatsu, Nagano Co., D.S. (Ser. 5, no. 243).

Ptychanthus striatus (L. et L.) N. (Lejeuneaceae) On tree trunks, 300 m., Kitagō, Miyazaki Co., S.H. (Ser. 1, no. 25); do., moist rocky ledges, 350 m., S.H. & T.K. (Ser. 3, no. 143).

Ptychocoleus nipponicus Hatt. On barks of trees, 300 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 4, no. 191); tree trunk, 10 m., Tomishima, Miyazaki Co., T.A. (Ser. 5, no. 244).

Pycnolejeunea imbricata (N.) Steph. Syn. *P. tosana* Steph. Rocks, 360 m., Isshoochi, Kumamoto Co., K.M. (Ser. 3, no. 144), as *P. tosana*.

P. obtusilobula Hatt. On branches of *Rhododendron*, subsciophilous, 100 m., Obi, Miyazaki Co., S.H. & T.K. (Ser. 2, no. 85). Paratype!

P. tosana → *P. imbricata*!

Radula amentulosa Mitt. Syn. *R. brunnea* Steph. and *R. abnormis* Steph. (Radulaceae) On clay-slate bluffs, 2100 m., Ashiyasu, Yamanashi Co., D.S. (Ser. 6, no. 291).

Radula constricta Steph. Syn. *R. lindbergiana* var. *onoi* Hatt.; *R. lindbergiana* Auct. pro maj. parte, quoad plant. Japon. Trunks of *Dispyros kaki*, 200 m., Ichibū, Kumamoto Co., K.M. (Ser. 5, no. 245); calcareous rocks and barks of trees, 300 m., Isshoochi, Kumamoto Co., K.M. (Ser. 3, no. 121), as *R. lindbergiana* var. *onoi*.

Radula japonica Gott. Barks of *Torreya nucifera*, 100 m., Shibakita, Oita Co., A.N. (Ser. 3, no. 119).

Radula kanemarui Hatt. Wetty rocks, 100 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 5, no. 246).

Radula kojana Steph. Shady, moist rocks, 300 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 3, no. 120); do., on rocks, 600 m., K.M. (Ser. 6, no. 292).

Radula lindbergiana var. *onoi* → *R. constricta*!

Radula obiensis Hatt. On trees, 300 m., Kitagō, Miyazaki Co., S.H. (Ser. 1, no. 18). From the type locality.

Radula oyamensis Steph. On tree trunks, meso- sciophilous, 100 m., Obi, Miyazaki Co., S.H. & T.K. (Ser. 2, no. 70); on barks of trees, 500 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 4, no. 192).

Radula valida Steph. On shaded rocks, 500 m., Sakatani, Miyazaki Co., S.H.

9) A typo recedit planta plus minus majore, foliis et foliorum lobis latioribus, ciliis marginibus numerosis (5-15).

(Ser. 2, no. 71); on shady, damp rocky ledge, 800 m., Mt. Hikosan, Fukuoka Co., Y.K. (Ser. 6, no. 293).

Radula variabilis Hatt. On shaded rocks, 100 m., Obi, Miyazaki Co., S.H. (Ser. 2, no. 72). From the original locality.

Reboulia hemisphaerica (L.) Raddi (Rebouliaceae) On rocks in exposed places, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 45).

Riccardia angustata → *R. planiflora*!

Riccardia decrescens (Steph.) Hatt. (Ricardiaceae) In ditches, marshy ground and wet, rotten branches, 30 m., Obi, Miyazaki Co., T.K. (Ser. 3, no. 146); on wet rocks, 100 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 6, no. 294).

R. miyakeana Schiffn. On rocks, subsciophilous, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 34); do., tuffy banks in shady, moist places, 20 m., S.H. (Ser. 3, no. 147).

R. pinguis (L.) Gray On rocks, mesophilous, 100 m., Obi, Miyazaki Co., S.H. & R.S. (Ser. 2, no. 95).

R. planiflora (Steph.) Hatt. Syn. *R. angustata* Hatt., nec Horik., quoad plant. Japon. On rotten logs, sciophilous, 500 m., Sakatani, Miyazaki Co., S.H. & T.K. (Ser. 2, no. 94).

R. sinuata (Dicks.) Trev. On wet rocks, 300 m., Kitagō, Miyazaki Co., S.H. (Ser. 2, no. 96).

R. submersa Horik. Rocks submerged in mountain brook, 1300 m., Mt. Chausu, N.T. (Ser. 6, no. 295).

Riccia fluitans L. (Ricciaceae) On damp ground, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 46); in water, 50 m., nr. Miyazaki Shrine, Miyazaki Co., S.H. (Ser. 1, no. 47); in stream, Hitoyoshi, Kumamoto Co., K.M. (Ser. 2, no. 100).

Riccia glauca L. var. *japonica* (Steph.) Hatt. Syn. *R. japonica* Steph. On soil, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 48).

Riccia japonica → *R. glauca* var. *japonica*!

Riccia miyakeana Schiffn. On soil, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 49).

Riccia nipponica Hatt. On clayey soil in garden, 15 m., Obi, Miyazaki Co., S.H. (Ser. 6, no. 296). From the type locality.

Riccia sorocarpa Bischoff On bare soil, 20 m., Obi, Miyazaki Co., T.K. & S.H. (Ser. 4, no. 193).

Ricciocarpus natans (L.) Cda. Aquatic, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 50).

Saccogyna curiosissima Horik. (Harpanthaceae) On trunks of *Tsuga* and *Cyclobalanopsis*, 600 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 3, no. 112).

Scapania ampliata Steph. (Scapaniaceae) On rocks, 1700 m., Mt. Ichifusa, Kumamoto Co., K.M. (Ser. 3, no. 115).

Sc. bolanderi Aust. var. *major* Amak. et Hatt. Syn. *S. caudata* Steph., pro parte; *S. robusta* Horik. On thin humus upon granite, 700 m., Isl. Yakushima, Kagoshima Co., T.A. (Ser. 4, no. 194), as *Sc. caudata*.

Sc. caudata → *Sc. bolanderi*!

Sc. integrerrima Steph. On moist or wetty granitic rocks, 500 m., Mt. Mukabaki, Miyazaki Co., T.A. (Ser. 6, no. 297).

Sc. ligulata Steph. Moist granite, 1300 m., Isl. Yakushima, Kagoshima Co., *T.A.* (Ser. 4, no. 195); do., wet granite, 700 m., *K.M.* (Ser. 4, no. 196), forma ad *Sc. parvitextam* Steph. ± transiens. Both from the type locality.

Sc. padulosa K. Müll. Granitic substratum submerged in stream, nr. top of Kiso-koma, 2730 m., Nagano Co., *D.S.* (Ser. 5, no. 247).

Sc. parvitexta Steph. var. *minor* Hatt. Granitic rocks, 900 m., Mt. Ichifusa, Kumamoto Co., *K.M.* (Ser. 3, no. 116).

Sc. spinosa Steph. On moist banks, Mt. Dantō in Kuma, Kumamoto Co., *K.M.* (Ser. 3, no. 117).

Sc. stephanii K. Müll. On rocks, meso- sciophilous, 100 m., Obi, Miyazaki Co., *S.H.* (Ser. 2, no. 64).

Sc. undulata (L.) Dum. Submerged in stream, 1500 m., Mt. Kujū, Oita Co., *T.A.* (Ser. 5, no. 248); granitic substratum submerged in stream, nr. top of Kiso-koma, 2960 m., Nagano Co., *D.S.* (Ser. 5, no. 249).

Schiffneria hyalina Steph. Syn. *S. viridis* Steph. (Cephaloziaceae) On soil, beneath forest, Hitoyoshi, Kumamoto Co., *K.M.* (Ser. 2, no. 69).

Sch. viridis→*Sch. hyalina*!

Solenostoma decurrens (Steph.) Hatt., comb. nov. Syn. *Jungermannia decurrens* Steph.¹⁰⁾; *J. fauriana* Bvrd.; *Haplozia reniformia* Horik. (Jungermanniaceae) Wet soil in marsh, 1400 m., Isl. Yakushima, Kagoshima Co., *T.A.* (Ser. 4, no. 168).

S. hiugaense Amakawa¹¹⁾=*Jungermannia hiugaensis* Amak. On moist granitic rocks, 900 m., Mt. Okue, Miyazaki Co., *T.A.* (Ser. 6, no. 267). Isotype!

S. senjoense Amakawa¹¹⁾=*Jungermannia senjoensis* Amak. On damp graywacke bluffs, 2430 m., Mt. Senjo, Nagano Co., *D.S.* (Ser. 6, no. 268). Isotype!

S. tristis (Nees) Hatt., comb. nov. Syn. *Jungermannia tristis* Nees¹²⁾. Wet chert, 1280 m., nr. Azusayama, Nagano Co., *D.S.* (Ser. 5, no. 221); do., submerged, *D.S.* (Ser. 5, no. 222).

Spruceanthus polymorphus (Sde. Lac.) Verd. (Lejeuneaceae) On trees, 100 m., Agata, Miyazaki Co., *S.H.* & *T.K.* (Ser. 3, no. 145).

Spr. semirepandus (N.) Verd. On tree trunks, 500 m., Sakatani, Miyazaki Co., *S.H.* (Ser. 2, no. 86).

Taeniolejeunea ocelloides (Horik.) Hatt. (Lejeuneaceae) On barks of *Cryptomeria japonica*, 500 m., w. slope of Mt. Ichifusa, Kumamoto Co., *K.M.* (Ser. 6, no. 298).

Targionia hypophylla L. (Targioniaceae) Crevices of rocks (chert, phyllite and graphite schist), 750 m., Tochimoto of Chichibu Mts., Saitama Co., *D.S.* (Ser. 5, no. 250).

Temnoma birmense (Steph.) Hatt. Syn. *Chandonanthus birmensis* Steph. (Jungermanniaceae) On rocks, Itsuki, Kumamoto Co., *K.M.* (Ser. 3, no. 102); rocky ledges, 100 m., Inuyama, Aichi Co., *S.H.* (Ser. 3, no. 103).

Thysananthus aculeatus Herz. (Lejeuneaceae) On barks, 500 m., Isl. Yakushima, Kagoshima Co., *T.A.* (Ser. 4, no. 197).

Trichocolea tomentella (Ehrh.) Dum. (Ptilidiaceae) Shaded rocks, 200 m., Sakatani, Miyazaki Co., *S.H.* (Ser. 1, no. 1); on moist rocks, Miwa, Aichi County, *N.T.*

10) Species Hepaticarum, 6: 85 (1917).

11) Description will be published elsewhere lately.

12) Naturg. Europ. Leberm. 2: 461 (1836).

(Ser. 3, no. 106).

Trichocoleopsis sacculata (Mitt.) Okamura Rotten log in woods, 700 m., Mt. Ichifusa, Kumamoto Co., K.M. (Ser. 4, no. 198); on decayed logs beneath forest, 1250 m., Mt. Unzen, Nagasaki Co., Y.K. (Ser. 6, no. 299).

Tuyamaella molischii (Schiffn.) Hatt. (Lejeuneaceae) On barks of broad-leaved evergreens, 700 m., Hitoyoshi, Kumamoto Co., K.M. (Ser. 6, no. 300).

Tuzibeanthus poreolloides Hatt. On limestone, 500 m., Shiiba, Miyazaki Co., T.A. (Ser. 4, no. 199).

Wiesnerella demidata (Mitt.) Steph. (Marchantiaceae) On shaded soil, 100 m., Obi, Miyazaki Co., S.H. (Ser. 1, no. 44); on stone-walls, 100 m., Yamaye, Kumamoto Co., K.M. (Ser. 4, no. 200).

List of Collectors

To economize space only initials are used for the names of collectors. The list below provides a key to these.

A. N.	A. NOGUCHI (野口 彰)
D. S.	D. SHIMIZU (清水 大典)
K. M.	K. MAYEBARA (前原勘次郎)
K. O.	K. OTI (越智一男)
M. K.	M. KAMIMURA (上村 登)
N. T.	N. TAKAKI (高木 典雄)
R. S.	(Miss) R. SHIMOSUGI (下杉 良子)
S. H.	S. HATTORI (服部 新佐)
T. A.	T. AMAKAWA (尼川 大録)
T. K.	T. KURATA (倉田 辰二)
T. O.	T. ONO (小野 孝)
Y. I.	Y. IKEGAMI (池上 義信)
Y. K.	Y. KUWAHARA (桑原 幸信)

昭和 21 年、日本苔類標本第 1 集を発行して以来、第 2 集を 22 年に、第 3 集を 24 年に、第 4 集を 25 年に、第 5 集を 26 年 12 月に、そして遂に第 6 集を本年 8 月に発行する運びとなつた。

姉妹エキシカタの日本蘚類標本第 1 集は 1 年おくれて昭和 22 年に発行したが、27 年には既に第 6 集迄終り、第 1~6 集の A B C 順種名リストを出し¹³⁾、現在では第 8 集を発行し、第 9 集を準備中である。

苔類の方がおくれたのは、種類数が遙かに少いこと及び 1 輻所で多量に採集し難い種が多いことに原因する。それでも第 6 集迄 300 点の標本中 230 種（変種など若干を加算）を収録し、邦産属の大半（普通品の殆ど全部）、科としては 1, 2（例えばミカヅキゼニゴケ 1 種を含む *Lunulariaceae*）を除き全部を収録出来たことは何よりの喜びである。

蘚類エキシカタにならい、上記の如く第 6 集迄の A B C 順種名リストを作つて使用者の便を計ることとした。又この機会にその後の学名の変化に従つて若干の種名を改めた。蘚類リストの終りに標

13) A. Noguchi & S. Hattori: *Musci Japonici (Exsiccati)* Ser. 1-6. *Journ. Hattori Bot. Lab.* 8: 67-76 (1952).

本集製作の計画と具体化、製作の労苦などに言及したので、ここでは省き、第6集迄300点の標本の採集者を採集点数の順にならべると次の如くである（敬称略）。

服部新佐、120点（但しこのうち25点は倉田、清水或いは下杉との共同採集）

前原勘次郎、76点

清水大典、48点（但しこのうち4点は服部と共同採集）

尼川大録、26点

倉田辰二、21点（但しこのうち20点迄は服部と共同採集）

桑原幸信、14点

高木典雄、7点

小野 孝、4点

野口 彰、3点

上村 登、2点（但し何れも稀産種¹⁴⁾）

池上義信、2点

越智一男、1点

下杉良子、1点（但し服部と共同採集）

以上の合計は325点となるが、2人の共同採品が50点あるので、実際は300点である。上記の採集者各位以外に、この第6集迄には収録されていないが、採集品を送つて若類又は蘚類エキシカタの発行に協力していただいている方に水島うらら、新敏夫、佐々木太一、久野哲夫、岩月善之助、渡辺良象その他の方々がある。

終りに、材料の採集に御協力いただいた前記前原勘次郎氏その他の各位、製作にあたつた倉田辰二氏その他の当研究所職員諸氏に深き謝意を表する。又この機会に御鞭達下さつた故中井猛之進先生、¹⁵⁾胡比奈泰彦先生外諸先生、先輩、友人各位の御厚意を記し、更に文部省民間研究機関事業補助金の交付に関して文部省当局に対し、深く感謝致します。この困難な標本集の発行が挫折すること無く今日に至つたのは一重に上記各位の御厚意の結晶であります。

14) *Frullania nodulosa* var. *nipponica* 及び *Fr. sackawana*

A REVISION OF THE JAPANESE SPECIES OF SCAPANIACEAE. II

By Tairoku AMAKAWA and Sinske HATTORI

尼川大碌, 服部新佐: 日本産ヒシャクゴケ科の再検討 (其二)¹⁾

Gen. *Scapania* Dum. Subgen. *Euscapania* (continued)

Sect. *Aequilobae* (K. Müll.) Buch

11. *Scapania spinosa* Steph. (Text-fig. VII, 14-26)

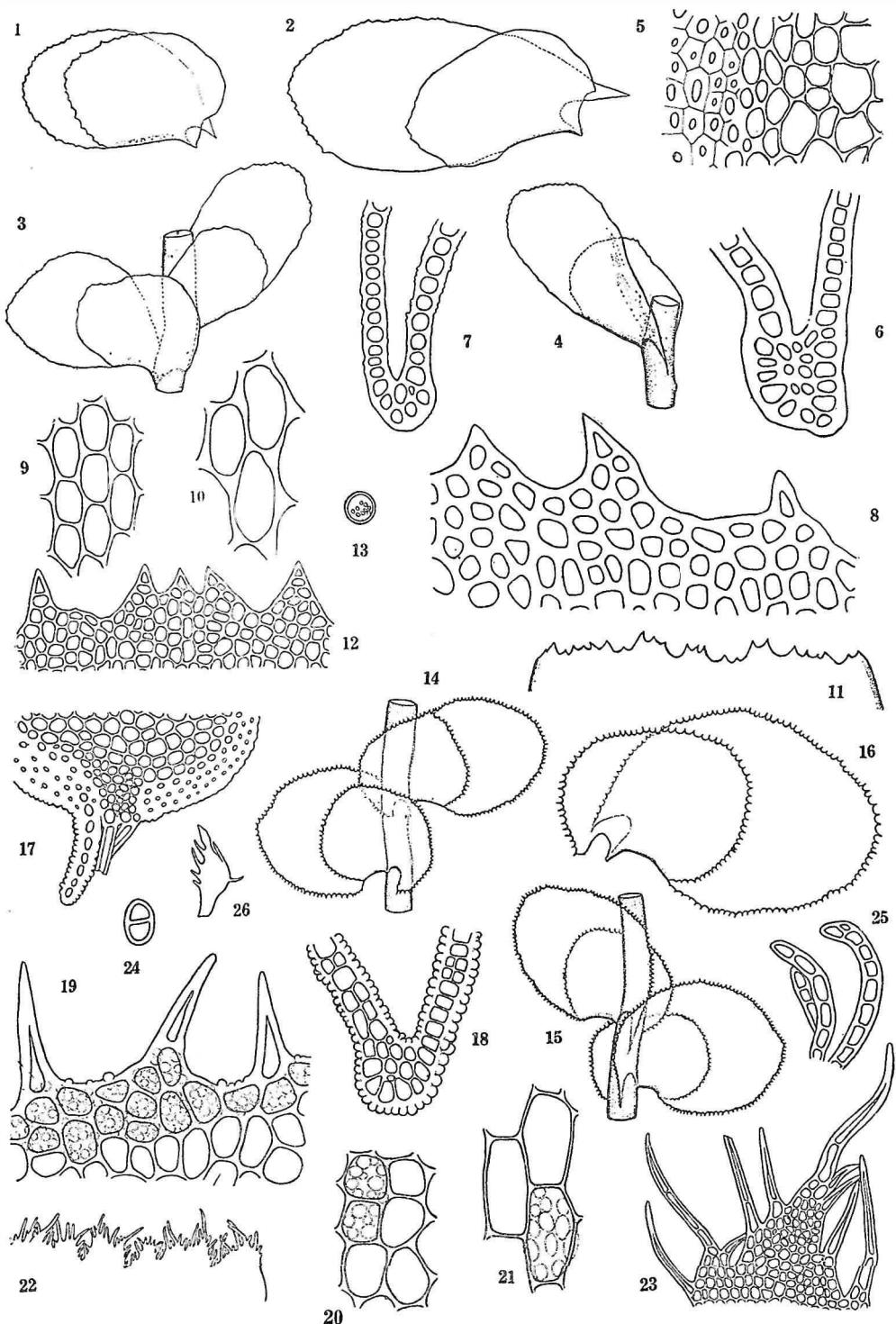
Scapania spinosa Steph. in Besch., Rev. Bryol., 21-2: 27 (1894), nom. nud.; Steph., Bull. Herb. Boiss. 5: 107 (1897); Inoue, Bot. Mag. Tokyo, 12: 74 (1898); K. Müll., Nova Acta Acad. Caes. Leop.-Carol. 83: 156, pl. 22a (1905); Steph., Spec. Hepat. 4: 149 (1910); Okamura, Journ. Coll. Sci. Imp. Univ. Tokyo, 36: 3 (1915); in Matsumura's Icon. Pl. Koishikav. 2: 101, pl. 135 (1915); Horik., Journ. Sci. Hiroshima Univ., B, 2, 2: 124, f. 5, pl. 15, 1-10 (1932); 2: 220 (1934); Bot. Mag. Tokyo, 68: 601 (1934); Ihsiba in Yadu's Nikko no Syokubutu to Dobutu, 191 (1936); Horik. in Asahina's Nippon Inkwasyokubutu Dukan, 847, pl. 406, 1-4 (1939); Bull. Attic Mus. 47: 60 (1940); Hatt., Bull. Tokyo Sci. Mus. 11: 72 (1944); Bull. Yamagata Agr. Coll. 1: 42 (1949); Journ. Hattori Bot. Lab. 4: 53 (1950); 5: 79, pl. 5, 10, pl. 6, 20 (1951); 8: 24 (1952); Oti, Shizen to Jimmon, 1: 66 (1950); Horik., Hikobia 1: 63 (1951); Kamimura, Contr. Hepat. Fl. Shikoku, 68 (1952). (Exsiccata) Hatt., Hepat. Japon. 3: 117 (1950).

? *Scapania levieri* K. Müll., Nova Acta Acad. Caes. Leop.-Carol. 83: 140, pl. 14b (1905); Yoshin., Bot. Mag. Tokyo, 20: 54 (1906); Steph., Spec. Hepat. 4: 139 (1910); Nichols. in Mazzetti's Symb. Sinic. 5: 29 (1930); Chopra, Proc. Ind. Acad. Sci. 8: 436 (1938).

Japanese name: Hari-himourokogoke (Yasuda, 1911); Uniba-hishakugoke (Okamura, 1925); Ibo-hishakugoke (Ihsiba, 1930,—*S. levieri*).

Plant 2-4 cm long, 3-4 mm wide, yellowish green to brownish, in loose mats or patches. Stem 0.34 mm thick, brown to blackish, simple or forked, ascending to erect: in cross section the cortex clearly differentiated from the interior region; cortical cells in 3-4 layers, brown, about $7 \times 3\mu$, radially compressed, the walls as thick as the cell-cavities; interior cells about 17μ , yellowish, thin walled. Rhizoids not numerous, scattered towards the apex of stem, long, colorless. Leaves rather distant to contiguous. Keel about 0.2 the length of the ventral lobe, slightly concave dorsally, 3-4 cells thick dorsiventrally, in cross section the angle acute, wing wanting. Dorsal lobe inserted with the line of attachment slightly curved upwards on the stem and ending straightly down considerably below the level of the keel, appressed to the stem, rectangular-oval, 3/5 the ventral in size, width 0.8-1.1 the length, arching beyond the stem up to the stem width, apex obtuse to rounded, margin densely ciliate. Ventral lobe nearly transversely inserted with the line of insertion curved moderately upwards on the stem and ending down far below the level of the keel, longly decurrent, somewhat horizontally spreading, convex, oval, 2-2.3 mm long, 1.4-1.8 mm wide (2/3-4/5 the length), apex rounded, margin somewhat recurved, densely ciliate, cilia acute, long, 1-2 (rarely 3-4) celled. Cells along margin of the ventral half of leaf $12-16\mu$, of middle $20-25 \times 17\mu$, of base $34-40 \times 17\mu$, walls

1) 本研究は文部省補助金に負う。



Text-fig. VII.

thickened along the margin, rather thin in the other part, trigones moderately thickened, mostly acute. Cuticle strongly and densely papillose. Gemmae 2-celled, $18 \times 12\mu$, green (with chloroplasts), walls thick and brownish. Plants unisexual. Male inflorescence terminal; bracts in several pairs, similar to the following leaves; antheridia 1-2, with some spinose paraphyses and often with a narrow foliose paraphyllum in the axile of the bract. Perianth oblong, 3.4 mm long by 2.3 mm wide, truncate, compressed dorsiventrally, mouth lobed, lobes with terminal and lateral cilia, the cilia 1-4 cells long, cuticle papillose.

Hab. Moist rocks, shallow humus, decaying wood; not uncommon in the montane region.

Type Loc. Hakodate, Hokkaido (or Yezo), Japan (*U. Faurie*).

Examinations: **Hokkaido:** Hakodate, *U. Faurie* 212, 216-isotype in Herb. Kyoto Univ. **Honshu:** Akita: *G. Koie* 123; Yamagata: Mt. Asahi, *S. Hattori* 1027; Fukushima: *S. H.* 663; Gumma: Oze, *S. H.* 664; Ibaragi: Mt. Tsukuba, *K. Sakurai* 149; Niigata: *Hatakeyama*; Mie: *K. Okada* 1, 10, 32, *T. Kodama* 3724; Wakayama: *K. O.* 2, 13, 14, 16; Nara: *T. K.* 2398; Osaka: *K. O.* 19, 20, 24, 40, 41; Hyogo: *Tuzibe* 2907, Mt. Funakoshi, *Y. Tatebe* 94; Okayama: *T. Amakawa* 155; Hiroshima: Isl. Miyajima, *K. S.* 2999; Yamaguchi: *I. Hino* 134. **Shikoku:** Ehime: *K. Oti* 3612, 3666; *S. H.* 5258, 5291, Mt. Ishizuchi, *S. H.* 5283, 5833. **Kyushu:** Kumamoto: *K. Mayebara* 1330, 1467a, 1519, 1533, 1604; Miyazaki: Mt. Sobo, *Y. Kuwahara* 753, Mt. Kurumi, *Y. K.* 931, Mt. Osuzu, *T. A.* 774, 933, 993, Mt. Wanizuka, *T. A.* 843, Mt. Kirishima *K. S.* 3000; Kagoshima: Mt. Kaimon, *T. Ito* 354, *T. Shin* 3573, Isl. Yakushima, *T. S.* 3616, 3741.

Range: Japan (Hokkaido, Honshu, Shikoku, Kyushu), Liukiu, Corea, Formosa, China, Himalaya.

The distinctly papillose cuticle and ciliate margin of leaf are remarkable. Besides, the decurrence of both dorsal and ventral leaf lobes, the ciliate lobes of perianth mouth and the two-celled gemmae indicate that the present species belongs to Sect. *Aequilobae*.

Text-fig. VII
Scapania ligulata Steph. (1-13)

1, 2, Leaves, $\times 16$. 3, Part of stem, dorsal v., $\times 10$. 4, Do., ventral v., $\times 10$. 5, Part of cross section of stem, $\times 285$. 6, 7, Cross sections of keel of leaf, $\times 150$. 8, Cells along leaf margin, $\times 285$. 9, Cells from leaf middle, $\times 285$. 10, Cells from leaf base, $\times 285$. 11, Mouth of perianth, $\times 25$. 12, Part of (11), $\times 150$. 13, Gemma, $\times 285$.

Scapania spinosa Steph. (14-26)

14, Part of stem, dorsal view, $\times 10$. 15, Do., ventral v., $\times 10$. 16, Leaf, $\times 16$. 17, Part of cross section of stem, $\times 150$. 18, Cross section of keel of leaf, $\times 150$. 19, Cells along leaf margin, $\times 285$. 20, Cells from leaf middle, $\times 285$. 21, Cells from leaf base, $\times 285$. 22, Part of perianth mouth, $\times 25$. 23, Lobe of perianth mouth, $\times 150$. 24, Gemma, $\times 285$. 25, Paraphyses, $\times 150$. 26, Paraphyllum, $\times 40$.

Fig. 1 was drawn from Hattori's Exsicc., Hepat. Jap. ser. 4, nr. 195; figs. 2-4, 6, 8-10 from *T. Shin* 3717, figs. 5, 7, 11-13 from *S. Hattori* 7363, figs. 14-23 from *T. Amakawa* 938, fig. 24 from *T. A.* 843, figs. 25, 26 from Hatakeyama's collection. All drawn by T. Amakawa.

Sect. **Stephania** Amak. et Hatt., sect. nov.

Plants unisexual. Stem simple or forked; in cross section the cortex clearly differentiated from the interior region, cortical cells in 2-5 layers with very thickened walls, sometimes bastfiber-like. Leaves contiguous to imbricate. Dorsal lobe transversely inserted, not decurrent, rectangular-oval or obovate, arching to the farther edge of the stem or across it, apex subacute with a point or obtuse, margin denticulate to dentate or ciliate-dentate towards the apex. Ventral lobe nearly transversely or somewhat succubously inserted with the line of insertion curved little to moderately upwards on the stem and ending down near or far below the level of the keel, slightly or more or less distinctly decurrent, rectangular-oval or oblong-ovate, apex subacute with a point or obtuse, margin denticulate to dentate, sometimes ciliate-dentate. Cells along margin of the ventral lobe of leaf $8-12\mu$, with almost equally thickened walls, cell-cavities ovoid with thickened trigones, or quadrate; cells of middle longer, cell-cavities rectangular to oblong with thin to somewhat thick walls and moderately thickened trigones; cells of base longer, with more or less thick walls, trigones moderately thickened, mostly trabeculate. Cuticle nearly smooth to verrucose. Gemmae ellipsoid, 1-(2) celled, green or occasionally reddish. Perianth terminal, oblong, truncate, dorsiventrally compressed, the upper part normally bent backwards, mouth dentate or rarely having ciliate lobes. Type: *S. stephani* K. Müll.

Scapania stephani was originally placed in 'Gruppe *Curta*' by K. Müller (1905). But the structure of stem which has 3 layers of thick-walled (often bast-fiber-like) cortical cells in the cross section and the well developed serration of leaf-margin show that *S. stephani* may be separable from the *Curta*-complex.

S. parvitexta Steph., a member of the present section, was once placed in 'Gruppe *Nemorosa*' by K. Müller (1905). Afterwards Evans (1930) put it to Sect. *Aequilobae*, because of its coarsely verrucose cuticle. In the same way he (1930) placed *S. granulifera*, spec. nov., in that section. Recently R. M. Schuster²⁾ changed the disposition of the latter to Sect. *Gracilidae*, stating, "The writer would stress that a coarsely verrucose cuticle has been developed several times in *Scapania*, and does not necessarily mean the species is closely related to the *Aequiloba*-complex." In the species of the present section verrucae of cuticle is very variable; it is coarsely verrucose, but more frequently verrucose to nearly smooth. They are distinct from the *Aequiloba*-complex by one-celled gemmae (rarely accompanied with two-celled ones) and the dorsal lobe of leaf which is not decurrent.

The present section stands near Sect. *Nemorosae*, both of which have one-celled gemmae. However, the present section is characterized by the green color of gemmae (excl. *S. Okanurana*), while the latter section have yellowish brown gemmae. Further, the present section is distinguished from Sect. *Nemorosae* by non-decurrent dorsal lobes of leaves, by the serration of leaves, by the thickened walls and trigones of cells of leaf margin, and by less collenchymatous cells of leaf middle.

2) R. M. Schuster, Note on Nearctic hepaticae, IV. *The Bryologist*, 54: 177-178 (1951).

12. *Scapania ligulata* Steph. (Text-fig. VII, 1-13)

Scapania ligulata Steph., Hedw. 44: 14 (1904); K. Müll., Nova Acta Acad. Caes. Leop.-Carol. 83: 122, pl. 49a (1905); Steph., Spec. Hepat. 4: 147 (1910); Hatt., Journ. Hattori Bot. Lab. 4: 52 (1950); 8: 24 (1952). (Exsiccata) Hatt., Hepat. Japon. 4: 195-196 (1951).

Scapania javanica var. *osumiensis* Hatt., Bull. Tokyo Sci. Mus. 11: 70, f. 43 (1944).

Scapania ligulata var. *osumiensis* Hatt., Journ. Hattori Bot. Lab. 4: 52 (1950).

Japan. name: Shitaba-hishakugoke (Ihsiba, 1930).

Plant 3-4 cm long, 3-4 mm wide, rigid, green to brownish yellow, in patches or loose mats. Stem 0.3-0.4 mm thick, dark brown to black, ascending to erect, sparingly branched, sometimes with subfloral innovations: in cross section the cortex clearly differentiated from the interior region; cortical cells in 3-5 layers, small, 5-13 μ , walls brown and as thick as cell-cavities, usually bastfiber-like; interior cells 17-25 μ , walls thinner towards the center, trigones large. Leaves contiguous to imbricate. Keel about 0.3 the length of the ventral lobe, straight to slightly curved dorsally, 2-5 cells thick dorsiventrally, in cross section the angle acute, wing commonly wanting. Dorsal lobe nearly transversely inserted, not decurrent, appressed to the stem, somewhat orbicular to oval, about half the ventral in size, width about 0.7-0.8 the length, arching to the farther edge of the stem, apex rounded, rarely with a point, margin distantly dentate towards the tip. Ventral lobe more or less succubously inserted with the line of insertion moderately arching upwards on the stem and ending down far below the level of the keel, decurrent to half the length of stem segment, oblong-ligulate, 1.5-2.2 mm long, 1.1-1.5 mm wide (width 2/5-2/3 the length), convex, apex rounded to obtuse, margin recurved, dentate, more coarsely so towards the apex, teeth triangular, valid, 1-3 cells long and wide. Cells of apex of the ventral lobe of leaf 10-12-(18) μ , cell-cavities roundish to quadrate with thickened walls and trigones, cells of middle 20-30 \times 10-17 μ , oblong, with rather thin walls and not so large trigones, cells at base 34-42 \times 17 μ , walls thick, somewhat trabeculate, confluent with large trigones. Cuticle smooth to verrucose. Gemmae rare, spherical, 17 μ , green, 1-celled. Plants unisexual. Perianth terminal, oblong, 3-3.8 mm long, 1.5-2 mm wide, truncate, dorsiventrally compressed, curving backwards, mouth dentate like the leaf margin.

Hab. Wet rocks (preferably on granitic rocks) along mountain stream, usually 800-1000 m. alt.

Type loc. Isl. Yakushima in S. Kyushu, Japan (*U. Faurie*).

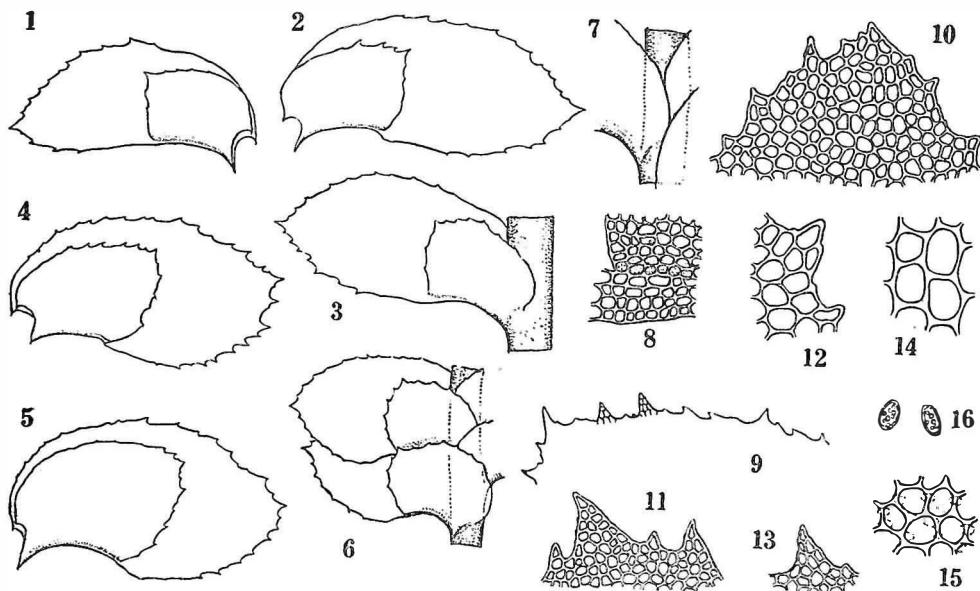
Examinations: Kyushu. Miyazaki: Mt. Osuzu, Y. Kuwahara 143, 177; Kagoshima: Mt. Takakuma, S. Hattori 1698, 1714, 1756-type of var. *osumiensis* Hatt. in Herb. Tokyo Univ., Tashiro, S. H. 1464, Isl. Yakushima, U. Faurie 882-isotype in Herb. Kyoto Univ., Y. K. 520, 523, T. Shin 7717, 3839, K. Mayebara 2992, 8314, S. H. 7363, 7466, 7559.

Range: Endemic in S. Kyushu, Japan. Known only from Isl. Yakushima (type loc.), Mts. Takakuma and Osuzu, and Osumi Pen. (Tashiro).

K. Müller (1905) originally described that the cuticle of the leaf is 'glatt'. S. Hattori (1950) proposed var. *osumiensis* which is larger and more robust in every respect and has well developed verrucae of the leaves. Such a divergent form, however, may be united into the same taxon by the occurrence of intermediate ones.

13. *Scapania stephanii* K. Müll. (Text-fig. VIII and IX)

Scapania stephanii K. Müll., Nova Acta Acad. Caes. Leop.-Carol. 83: 273, pl. 41, 50b (1905); Yoshin., Bot. Mag. Tokyo, 20: 53 (1906); Ihsiba, Bot. Mag. Tokyo, 21: 45 (1907), c. (?) Steph., Spec. Hepat. 4: 143 (1910); I. Ito, Fl. Mieken 801 (1932); K. Müll., Hedw. 81: 276 (1944), under *S. subtilis*; Hatt., Nat. Sci. & Mus., Tokyo, 14: 163, f. 4 (1944); Bull. Tokyo Sci. Mus. 11: 72 (1944); Journ. Hattori Bot. Lab. 5: 79, pl. 5, 11-12 (1951); 8: 24 (1952); Magofuku, in A List of Animals and Plants of the Ise Grand Shrine Area, III. Bryophyta, 26 (1952); Kamimura, Contr. Hepat. Fl. Shikoku, 68 (1952); Shin, Hyogo Biol. 2: 158 (1953). (Exsiccata) Hatt., Hepat. Japon. 2: 64 (1947).

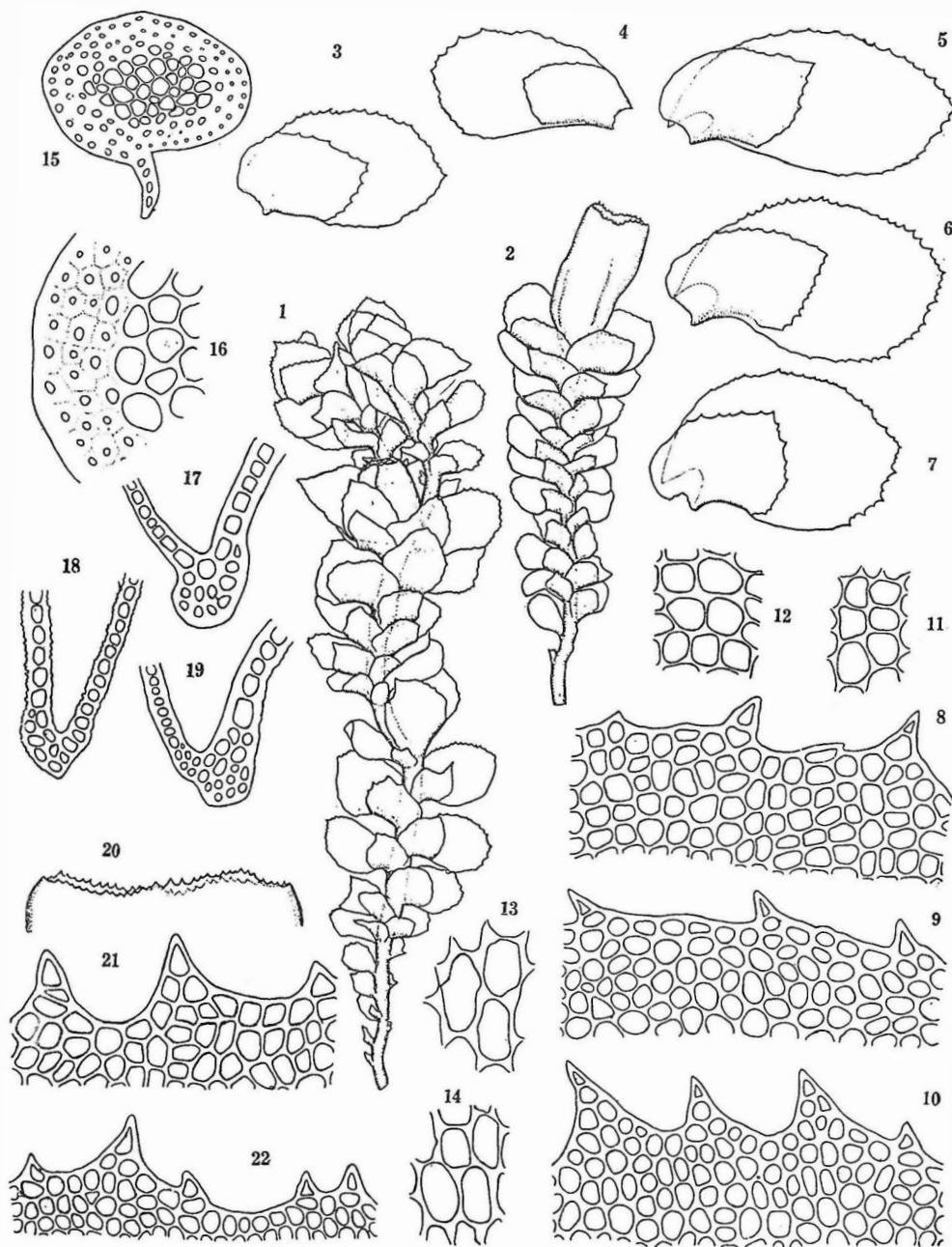
Text-fig. VIII *Scapania stephanii* K. Müll.

1-5, Leaves, $\times 40$. 6, Part of stem, dorsal v., $\times 28$. 7, Do., ventral v., $\times 40$. 8, Part of insertion of dorsal lobe to keel, $\times 150$. 9, Part of ventral lobe, margin towards apex, $\times 80$. 10, 11, Cells of leaf apex, $\times 150$. 12, Cells from leaf margin, $\times 300$. 13, Do., $\times 150$. 14, 15, Cells of leaf middle, $\times 300$. 16, Gemmae, $\times 300$. Figs. 1-3, 7, 8, 10, 12, 14, 16 were drawn from the specimen, K. Oti 1176, the others from K. Oti 1153. All were drawn by S. Hattori.

Text-fig. IX *Scapania stephanii* K. Müll.

1, 2, Parts of plant, dorsal view, $\times 10$. 3-7, Leaves, $\times 25$. 8-10, Cells along leaf margin, $\times 285$. 11, 12, Cells from leaf middle, $\times 285$. 13, 14, Cells from leaf base, $\times 285$. 15, Cross section of stem, $\times 150$. 16, Part of (15), $\times 285$. 17-19, Cross sections of keel of leaf, $\times 150$. 20, Mouth of perianth, $\times 25$. 21, 22, Parts of (20), $\times 285$.

Figs. 1, 3, 7, 8, 11, 13, 16, 18 were drawn from K. Sakurai 2987-isotype of *S. subtilis*, figs. 2, 4, 9, 12, 14, 19, 22 from Hattori's Exsicc., Hepat. Jap., ser. 2, nr. 64, figs. 6, 10 from Y. Kuwahara 553, figs. 15, 17, 20, 21 from K. Mayebara 3284. All drawn by T. Amakawa.



Text-fig. IX

Scapania subtilis Warnst., Hedw. 57: 65, f. 5 (1916); 63: 79 (1921).

Scapania brevis Steph. in Yoshin., Bot. Mag. Tokyo, 15: 93 (1901), nom. nud.—Cf. Evans, Proc. Wash. Acad., Arts & Sci. 8: 160 (1906).

Scapania japonica Gott. in herb.; Warnst., Hedw. 63: 71 (1921).

Scapania japonica Steph. in Yoshin., l.c. 17: 39 (1903), nom. nud.—Cf. Evans, l.c.

Scapania javanica var. *nipponica* Hatt., Bull. Tokyo Sci. Mus. 11: 70, f. 42 (1944); Journ. Hattori Bot. Lab. 4: 52 (1950); Oti, Shizen to Jimmon 1: 66 (1950); Kamimura, l.c., 67 (1952).

Japan. name: Chabo-hishakugoke (Ihsiba, 1930); Tsukushi-hishakugoke (Hattori, 1944); —*S. javanica* var. *nipponica*.

Plant 1–2 cm, rarely to 3 cm long, 1.5–2.5 mm wide, green to brownish, occasionally red, in mats. Stem 0.2–0.25 mm thick, green or usually brown to reddish, ascending to erect, simple or sparingly branched, often with 1–2 subfloral innovations: in cross section the cortex clearly differentiated from the interior region, cortical cells in 2–3 layers, brown, averaging 7μ , slightly radially compressed, walls as thick as cell-cavities, often bastfiber-like; interior cells white, 14μ , thin walled. Rhizoids few, sometimes scattered towards the stem tip. Leaves rather distant to contiguous, rarely somewhat imbricate, usually larger up the shoot. Keel rather short, 0.3–0.4 the length of the ventral lobe, slightly concave dorsally, 3–5 cells thick dorsiventrally, wing distinct or nearly wanting.³⁾ Dorsal lobe nearly transversely inserted, not decurrent, appressed to the stem, rectangular to ovate, $3/5$ – $3/4$ the ventral in size, width about 0.7 the length, arching to middle of the stem or up to its farther edge or rarely a little across it, apex subacute with a point or obtuse, margin denticulate to dentate towards the tip. Ventral lobe nearly transversely inserted with the line of insertion curved upwards on the stem and ending down about the level of or below the keel, more or less decurrent, obovate to oval, 0.6–1.4 mm long, 0.4–0.8 mm wide ($1/2$ – $3/5$ the length), apex subacute with a point or obtuse, margin somewhat recurved, minutely to coarsely dentate towards the apex, teeth 1–3–(4) cells long and 1–2–(3) cells wide at the base. Cells of apex and along margin of the ventral lobe of leaf 8 – 12μ , cell-cavities round to oval with equally thickened walls and moderately thickened trigones, cells of middle 14 – 17μ , oval to quadrate with rather thin walls and not so large trigones, of base 26 – $34 \times 14\mu$, rather trabeculate. Cuticle smooth to more or less verrucose. Gemmae green, 1-celled. Plants unisexual. Male inflorescence terminal; bracts in several pairs, similar to the following leaves but smaller in size. Perianth terminal, oblong, 1.8–2.7 mm long, 1–1.5 mm wide, truncate, dorsiventrally compressed, the upper part more or less bent towards the ventral side, mouth denticulate to dentate, or rarely spinose-dentate.

Hab. Moist rocks and thin soil, rarely wet or irrigated rocks; widely distributed in lowland, mostly 50–600 m. alt., common in S.W. flank of Japan.

Type loc. Mt. None, Kochi County, Shikoku, Japan, (T. Yoshinaga).

Examinations: Honshu. Chiba: S. Asano 28; Tokyo: Mt. Taka, K. Sakurai 26; Shizuoka: K. S. 2987-isotype of *S. subtilis* Warnst. in Herb. Hattori Bot. Lab.; Mie: K.

3) It often appears as if a narrow wing present, but as a matter of fact the dorsal lobe of leaf meets the ventral one together at the upper portion of the enlargement of keel (See Text-fig. VIII, 8, and IX, 17).

Okada 53, 65, *T. Kodama* 2304, 3803, *T. Magofuku* 169, 278, 286, 361, 412; *Wakayama*: *K. O.* 5, 6; *Nara*: Mt. *Yoshino*, *T. K.* 2399; *Kyoto*: Mt. *Hiei*, *K. S.* 172; *Osaka*: *K. O.* 31, *T. K.* 1194, 2196, *T. Nakajima* 118; *Hyogo*: *T. Shin* 2951; *Okayama*: *Ch. Igi* 1027, *T. Amakawa* 156. **Shikoku**. *Ehime*: *M. Tokui* 947, 1317, *K. Oti* 639, 661, 2302, 7343, *Omogo*-*Ishizuchi*, *S. Hattori* 4916; *Kochi*: *H. Inoue* 694, 695, *S. H.* 4906, 6001. **Kyushu**. *Fukuoka*: *Y. Omura* 99, *Y. Kuwahara* 1741, 1718; *Kumamoto*: *K. Mayebara* 642, 1121, 1212, 1215, 1229, 1231, 1242, 1343, 1380, 1411, 1412, 1455, 1466, 1503, 1593, 1765, 2040, 2166, 2321, 2678, 3177, 3269, 3278, 3284, 2413; *Miyazaki*: *S. H.* 9695, 10588, 10788, 11097, 16215, 80895, *Mt. Osuzu*, *T. K.* 158, 350, 357, 1004, 1022, *T. A.* 754, 759, 764, 771, 772, 782, 830, *Mt. Sobo*, *T. A.* 657, *Mt. Mukabaki*, *T. A.* 643, 966, 1058, *Takahiro*, *T. A.* 690, 830, 831, 977, 997, 1000, 1051, 1072, 1074, *Mt. Okue*, *T. A.* 1139; *Kagoshima*: *T. S.* 3001, *Mt. Sakurajima*, *T. Shin* 3528, 3530, *Mt. Kaimon*, *T. S.* 3579, 3933, 3942, 3966, *Isl. Koshiki*, *T. S.* 3957, 3982, 4001, 4006.

Range: Endemic in Japan (Honshu, Shikoku, Kyushu).

Warnstorff (1916, 1912) proposed *S. subtilis* basing on Sakurai's collection (Mt. Takao, Tokyo). He described leaf cuticle 'papillos'. However, K. Müller (1944) referred *S. subtilis* to the present species; he said, "Die Pflanzen ist deutlich identisch mit der von mir schon 1905 beschrieben *S. stephanii* K. M." In the original description of *S. stephanii*, Müller (1905) did not mention about the cuticle, but the authors suppose that his material had a nearly smooth cuticle. The development of verrucae of leaf surface is very variable (papillose to nearly smooth) in the present species, as we will see in *S. parvitexta*. The separation of the present species from *S. parvitexta* and *S. parvidens* is rather difficult. Three species are all variable and belong to common species in our area. In general, the present species occurs at lower elevation (50–600 m. alt.), while *S. parvitexta* at higher, and *S. parvidens* at highest elevation.

14. *Scapania parvitexta* Steph. (Text-fig. X)

Scapania parvitexta Steph., Bull. Herb. Boiss. 5: 107 (1897); K. Müll., Nova Acta Acad. Caes. Leop.-Carol. 83: 158, pl. 25b (1905); Yoshin., Bot. Mag. Tokyo, 20: 53 (1906); Steph., Spec. Hepat. 4: 148 (1910); Evans, Bull. Torr. Bot. Cl. 57: 87–111, under *S. granulifera* with figs. (1930); Ihsiba in Yadu, Nikko no Syokubuto to Dobutu, 191 (1936); Hatt., Bull. Tokyo Sci. Mus. 11: 71 (1944); Journ. Jap. Bot. 20: 165, f. 48, 44 (1944); Yamagata Agr. Coll. 1: 42 (1949); Journ. Hattori Bot. Lab. 4: 52 (1950); 8: 54 (1952); 10: 69 (1953); Oti, Shizen to Jimmon, 1: 66 (1950).

Scapania japonica Steph. (non Gott. in herb.; Warnst.) in Yoshin., l.c. 27: 39 (1903), nom. nud.

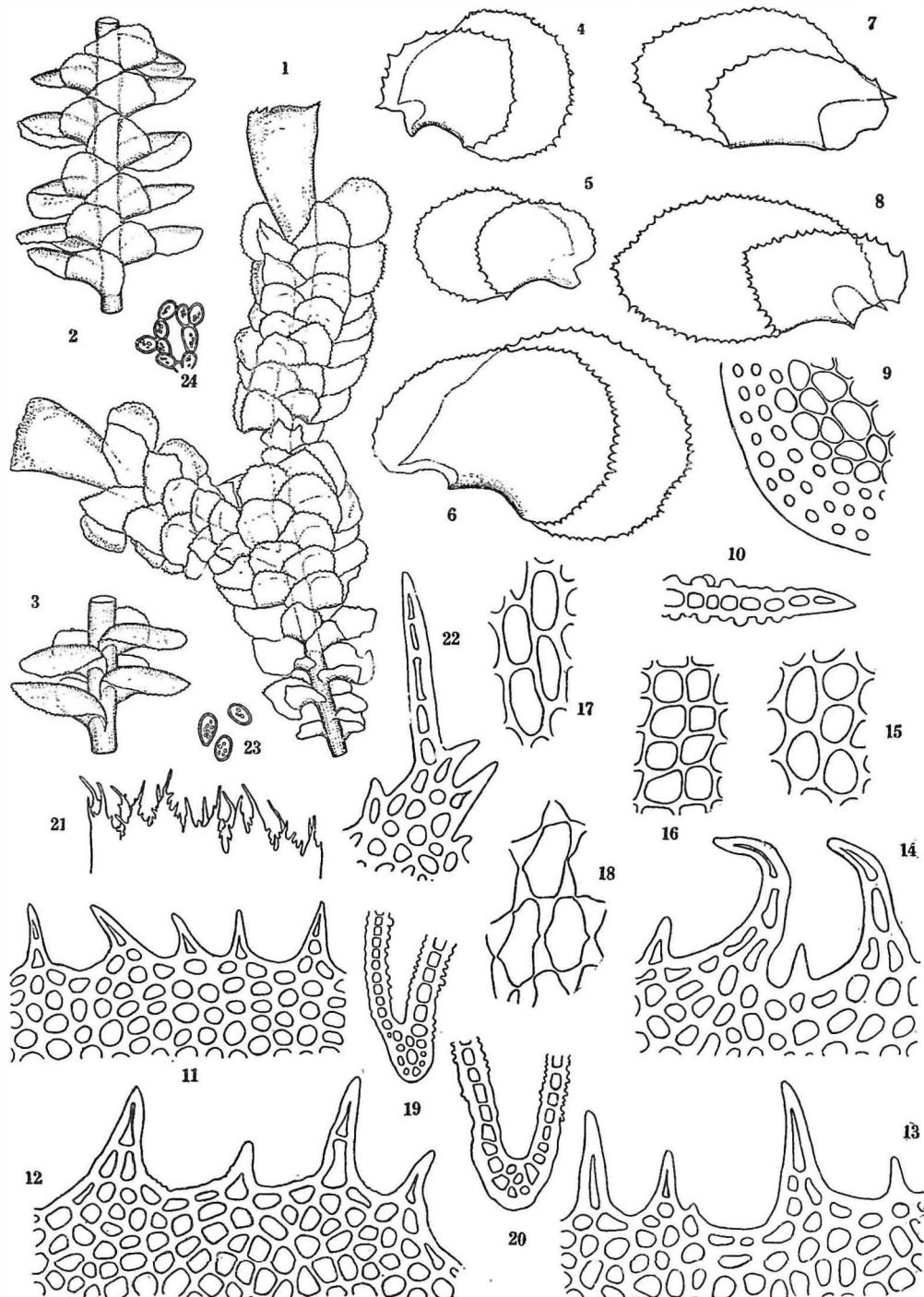
Scapania hirosakiensis Steph. in K. Müll., l.c. 83: 120, pl. 11a (1905); Steph., Spec. Hepat. 4: 150 (1910); Horik., Journ. Sci. Hiroshima Univ., B, 2, 2: 219 (1934); Hikobia, 1: 63 (1951).

Scapania parvitexta fo. *hirosakiensis* Hatt., Journ. Jap. Bot. 20: 167, f. 44 (1944); Kamim., Contr. Hepat. Fl. Shikoku, 67 (1952).

Scapania parvitexta var. *hirosakiensis* Hatt., Journ. Hattori Bot. Lab. 4: 52 (1950).

Scapania parvitexta var. *purpurascens* Warnst., Hedw. 63: 78 (1921),—syn. nov.

Japanese name: Koamime-urokogoke (Yasuda, 1911); Koamime-hishakugoke (Ihsiba, 1930); Himo-urokogoke (Yasuda, 1911, -*S. japonica*); Togeha-hishakugoke (Ihsiba, 1930, -*S. hirosakiensis*).



Text-fig. X

Plant 1-3 cm long, 1.7-2.4 mm wide, usually pale green, the upper part often tinged with purple, in patches or mats. Stem 0.2-0.3 mm thick, brownish to almost black, the upper part dark green, simple, rarely forked, ascending: in cross section the cortex clearly differentiated from the interior region except the ventral side where it is wanting; cortical cells in 3-5 layers, brown, about 8μ in diameter, the walls as thick as cell-cavities; interior cells about $14-17\mu$, yellowish, thin walled, with small to moderately large trigones. Rhizoids scattered towards the upper part of the stem, not numerous, long, colorless. Leaves densely imbricate, rarely contiguous. Keel 0.3-0.6 the length of the ventral lobe, slightly concave dorsally, 2-4 cells thick dorsiventrally, in cross section the angle somewhat rounded to obtuse, wing usually wanting. Dorsal lobe nearly transversely inserted, not decurrent, somewhat appressed to the stem, rectangular to obovate, about $2/3-4/5$ the ventral lobe in size, width 0.7-0.9 the length, arching beyond the farther edge of the stem for half the stem width, apex rounded to obtuse, occasionally with a point, margin irregularly dentate to ciliate-dentate. Ventral lobe somewhat transversely inserted with the line of insertion curved moderately upwards on the stem and ending down about the level of the keel, more or less decurrent, oval to obovate, 0.8-1.2 mm long, 0.6-1 mm wide (width 0.7-0.9 the length), convex, apex rounded to obtuse, or sometimes subacute with a point, margin densely ciliate-dentate, teeth acute, 1-4 cells long, 1-3 cells wide. Cells along margin of the ventral lobe of leaf $8-10\mu$, of middle $17-20 \times 12-15\mu$, of base $20-34 \times 12-15\mu$ (rarely 20μ), walls usually equally thickened, trigones indistinct to moderately large, sometimes nodulose. Cuticle coarsely to weakly verrucose. Gemmae rare, ellipsoid, $12-15 \times 8-10\mu$, 1-celled, green or occasionally reddish, in masses at the tip of stem or at the leaf margin of upper stem. Plants unisexual. The male inflorescence terminal, bract similar to the following leaves but smaller in size. Perianth terminal, oblong, 3 mm long and 1.2 mm wide, truncate, dorsiventrally compressed, the upper part bent towards the ventral side, mouth about 16-lobed, lobe bearing a long terminal and a series of lateral teeth. Spores $10-11\mu$. Elaters 8.7μ thick.

Hab. Preferably on shaded granitic and other basic rocks (never found on limestone), and thin humus on rocks, sometimes on decayed wood. One of the most common species distributed in the montane regions (mostly 800-1600 m. alt. in southern and middle Japan, but far lower towards north).

Type loc. Hakodate in Hokkaido (or Yezo), Japan (*U. Faurie*).

Examinations. Hokkaido: Hakodate, Nov. 30, 1893, *U. Faurie* 15123-isotype in Herb.

Text-fig. X *Scapania parvitexta* Steph.

1, Part of plant, with two perianths, dorsal view, $\times 10$. 2, Part of stem, dorsal v., $\times 10$. 3, Do., ventral v., $\times 10$. 4-8, Leaves, $\times 25$. 9, Part of cross section of stem, $\times 285$. 10, Cross section through leaf margin, $\times 285$. 11-14, Cells along leaf margin, $\times 285$. 15, 16, Cells from leaf middle, $\times 285$. 17, 18, Cells from leaf base, $\times 285$. 19, 20, Cross sections of keel of leaf, $\times 150$. 21, Mouth of perianth, $\times 25$. 22, Apex of lobe of perianth mouth, $\times 285$. 23, 24, Gemmae, $\times 285$.

Figs. 1, 4, 5, 10, 11, 19, 21 were drawn from the specimen, T. Kodama 463, figs. 2, 3, 7, 12, 16, 18, 20 from *U. Faurie* 24-isotype of *S. hirosakiensis*; figs. 6, 9, 13-15, 17, 22 from *U. Faurie* 20; fig. 8 from *U. F.* 131, figs. 23, 24 from T. Sasaki 4171. All drawn by T. Amakawa.

Kyoto Univ., *U. F.* 20, Mt. Daisetsu, *T. Sasaki* 4171. **Honshu.** Aomori: Hirosaki, *U. Faurie* 24-isotype of *S. hirosakiensis* in Herb. Kyoto Univ., Aomori, *U. F.* 131, 471, Mt. Hakkoda, *M. Saio* 2940; Akita: *K. Hisauchi*; Yamagata: Mt. Asahi, *S. Hattori* 1016, 1024-1026; Tochigi: Nikko, *K. Sakurai* 246; Gumma: Hatomachi Pass, *S. H.* 661; Kanagawa: *Iki* 1734, Mt. Hakone, *S. H.* 2958; Chiba: Mt. Kiyosumi, *Y. Ikegami* 2857; Tokyo: *S. H.* 3999a; Nagano: Nakabusa, *S. H.* 1016, 1388, 1390, Mt. Tsubakuro, *S. H.* 1391, 1392, Tsubame-iwa in S. Alps, *N. Takaki* 12018; Gifu: Hirayu, *T. Kodama* 2275, 2278, *S. H.* 48; Kyoto: Mt. Hiei, *K. S.* 173; Nara: Mt. Kasuga, *T. K.* 2334, Mt. Odaigahara, *T. K.* 4331, 4641, 4642; Hyogo: *Y. Tatebe* 186, Mt. Rokko, *M. Tagawa* 249; Tottori: *U. F.* 394. **Shikoku.** Ehime: Mt. Higashi-akaishi, *H. Inoue* 1623, *M. Tokui* 892, 921, 935, 941, Mt. Ishizuchi, *S. H.* 5278, *K. Oti* 617; Tokushima: *U. F.* 662, Mt. Tsurugi, *U. F.* 648, *M. T.* 306. **Kyushu.** Fukuoka: Mt. Hikosan, *Y. Kuwahara* 1382; Oita: Mt. Kuju, *T. Amakawa* 869, 874, 897, 903, 909, 918, *T. Ono* 2421, 2425; Kumamoto: *K. Mayebara* 892; Miyazaki: Mt. Kirishima, *T. A.* 195, 510, 511, 525, Mt. Wanizuka, *T. A.* 846, Mt. Osuzu, *T. A.* 719, Mt. Okue, *T. A.* 1129, 1130, Mt. Sobo, *U. F.* 335, *T. A.* 1026, 1031, 1037, 1044, 1080; Kagoshima: *K. S.* 3902, Mt. Sakurajima, *U. F.* 819, Isl. Yakushima, *K. M.* 2935, *T. Shin* 3623, 2637, 3643, 3705, *Y. K.* 546, *T. A.* 48. *U. Faurie's* collections are all deposited in Herb. Kyoto Univ.; *S. Hattori* 1016 and 1404 in Herb. Nat. Sci. Mus., Tokyo.

Range: Japan (Hokkaido, Honshu, Shikoku, Kyushu).

The present species is remarkable by its ciliate teeth and coarsely verrucose cuticle of the leaves. These characters, however, are variable and often develop only weakly, approaching ultimately to those of *S. parvidens*.

S. hirosakiensis is regarded as a form of the present species. The plant is brownish in color and the leaf more acute, and the keel of leaf longer.

15. *Scapania parvidens* Steph. (Text-fig. XI)

Scapania parvidens Steph., Hedwigia, 44: 15 (1904); K. Müll., Nova Acta Acad. Caes. Leop.-Carol. 83: 62, pl. 49b (1905); Yoshin., Bot. Mag. Tokyo, 20: 53 (1906); Steph., Spec. Hepat. 4: 147 (1910); Ihsiba in Yadu, Nikko no Shokubuto to Dobutu, 191 (1936); Hatt., Bot. Mag. Tokyo, 58: 3, f. 10 (1944); Journ. Hattori Bot. Lab. 8: 24 (1952); 12: 69 (1953).

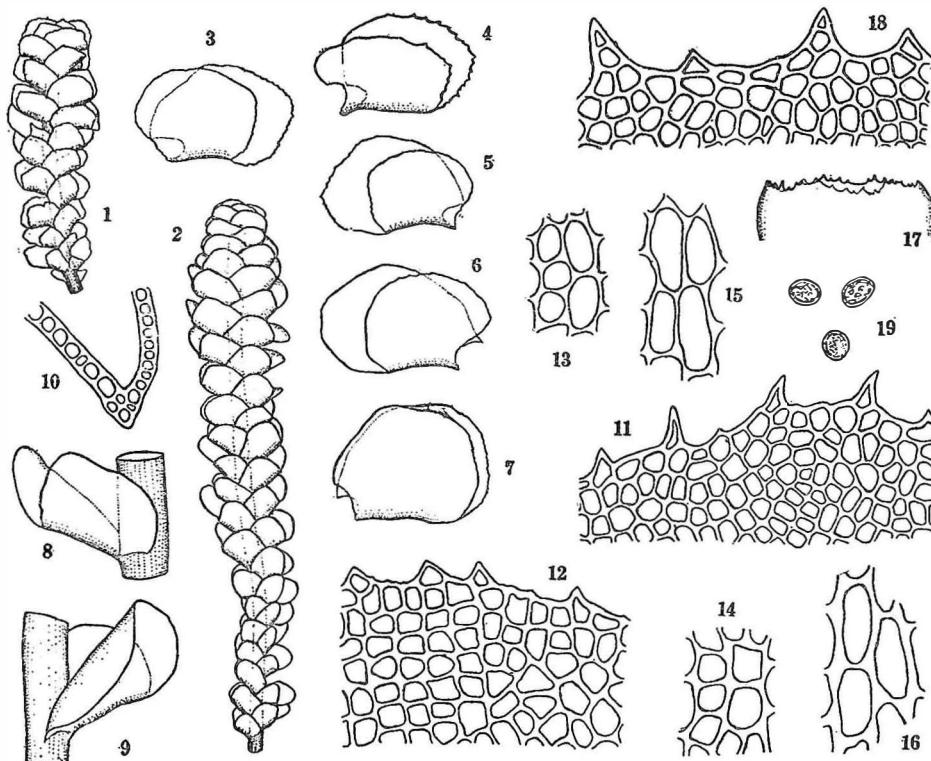
Scapania parvitexta var. *minor* Hatt., Bull. Tokyo Sci. Mus. 11: 71 (1944); Journ. Hattori Bot. Lab. 4: 52 (1950); 5: 79, pl. 6, 19 (1951); Oti, Sizen to Jimmon, 1: 66 (1952); Kamim., Contr. Hepat. Fl. Shikoku, 67 (1952). (Exsiccata) Hatt., Hepat. Japon. 3: 116 (1950).

Scapania conifolia Steph., Spec. Hepat. 6: 501 (1924),—syn. nov.

Japanese name: Koba-urokogoke (Yasuda, 1911); Ko-hishakugoke (Ihsiba, 1930); Hime-hishakugoke (Ihsiba, 1930, -*S. conifolia*).

Plant small, about 1 cm long, 1-2 mm wide, green to brownish, often tinged with purple, in depressed mats. Stem 0.16-2.0 mm thick, brownish to blackish, usually simple, ascending; in cross section the cortex clearly differentiated from interior region; cortical cells in 2-3 layers with very thick walls. Rhizoids scarce. Leaves contiguous to imbricate. Keel 0.5-0.6 the length of the ventral lobe, straight or nearly so. Dorsal lobe transversely inserted, not decurrent, more or less appressed to the stem, oval-rectangular, 3/4-1 the ventral in size, width 0.8-1 the length, arching hardly to the farther edge of the stem or slightly across it, apex obtuse to rounded, margin weakly denticulate towards the apex. Ventral lobe nearly transversely inserted with the line of insertion slightly to moderately

curved upwards on the stem and ending down about the level of keel, hardly decurrent, obovate, 0.6–0.7 mm long, 0.5–0.6 mm wide ($3/4$ – 1 the length), apex obtuse with a point or rounded, margin sometimes recurved, denticulate towards the tip, teeth 1–(2)-celled, usually acute. Cells of the leaf apex 7 – 10μ , of the leaf middle 12 – 15 –(20) μ , of the base 34 × 15μ , walls somewhat to moderately thick, trigones indistinct to moderately thickened. Cuticle smooth to more or less verrucose. Gemmae rare, ovoid to ellipsoid, 12 – 14μ , green, 1-celled. Plants unisexual. Male inflorescence terminal; bracts 2–3 pairs. Perianth oblong, 1.5–2 mm long and 0.8–1 mm wide, truncate, dorsiventrally compressed, the upper part often more or less bent backwards, mouth dentate-spinose.



Text-fig. XI *Scapania parvidens* Steph.

1, 2, Parts of plant, dorsal v., $\times 10$. 3–8, Leaves, $\times 25$. 9, Do., ventral v., $\times 25$. 10, Cross section of keel of leaf, $\times 150$. 11, 12, Cells along leaf margin, $\times 285$. 13, 14, Cells from leaf middle, $\times 285$. 15, 16, Cells from leaf base, $\times 285$. 17, Mouth of perianth, $\times 25$. 18, Part of (17), $\times 285$. 19, Gemmae, $\times 285$.

Figs. 1, 3, 5, 11, 13, 15 were drawn from *U. Faurie* 1296-isotype of *S. parvidens*, figs. 4, 19 from *K. Oti* 801, figs. 17, 18 from *T. Higuchi* 81, the others from *Ihsiba* 28-type specimen of *S. conifolia*. All drawn by T. Amakawa.

Hab. On rocks, preferably on granitic and volcanic rocks, rarely on soil (not found on limestone). One of the most common species in the alpine and subalpine regions of

our area, ascending to the elevation of 25–3000 m. (*Pinus pumila* zone), but more frequently at the altitude between 1000 and 2000 m.

Type loc. Perhaps Mt. Jizogatake near Kofu, Nagano County, Middle Japan (*U. Faurie*) may be considered.

Examinations: **Honshu.** Yamagata: Mt. Asahi, *S. Hattori* 1003; Fukushima: Mt. Higashi-azuma, *T. Higuchi* 81; Tochigi: Nikko -Yumoto, *Igi* 1683; Gumma: Oze, *U. Mizushima* 1398; Nagano: Mt. Jizogatake, *U. Faurie* 1296-isotype (?) in Herb. Kyoto Univ., Mt. Natsuzawa, *Ihsiba*, -type of *S. conifolia* in Conserv. Bot. Geneve, Nakabusa, *S. H.* 1401, 1403, between Mts. Tsubakuro and Otenjo, *S. H.* 1411, Mt. Mitsugatake, *T. Kuno* 8; Kyoto: *T. Kodama* 2814, Mt. Oyeyama, *T. K.* 3695; Nara: *T. Nakajima* 700; Osaka: *K. Okada* 24, Mt. Kongo, *T. K.* 9218. **Shikoku.** Ehime: *K. Oti* 3597, 3651, 3653, 801, 802, 2141, Mt. Ishizuchi -Omogo, *M. Tokui* 1529, 1534, 1536, 1540, 1549, 1543, Mt. Ishizuchi, *M. T.* 1370. **Kyushu.** Kumamoto: *K. Mayebara* 1517, Mt. Ichifusa, *K. M.* 1558, 1580, 1591; Miyazaki: Mt. Kirishima, *S. H.* 311-type of *S. parvitexta* var. *minor* in Herb. Tokyo Univ., *T. Amakawa* 524, Mt. Sobo, *T. A.* 676, 1141; Kagoshima: Isl. Yakushima, *S. H.* 7439, *T. A.* 21.

Range: Japan (Honshu, Shikoku, Kyushu).

The present species is most closely related to *S. parvitexta*. The separation of the two species often is very difficult. Hattori (1944) proposed a varietal name, *S. parvitexta* var. *minor*, for the intermediate plants between these two.

S. conifolia described by Stephani basing on Ihsiba's collection proves to be merely a form of the present species; the leaves are obovate-obconic, dorsal lobe nearly as large as the ventral, and the ventral lobe recurving strongly.

16. *Scapania integerrima* Steph. (Text-fig. XII, 13–30)

Scapania integerrima Steph., Spec. Hepat. 4: 148 (1910); Hatt., Journ. Hattori Bot. Lab. 8: 24 (1952).

Plant 2 cm long, 1.2–1.6 mm wide, somewhat slender, yellowish to reddish, in mats. Stem 0.2 mm thick, brown, sparingly branched, ascending: in cross section the cortex clearly differentiated from the interior region: cortical cells in 2–3 layers, brown, 5–8 μ , the walls as thick as the cell-cavities; interior cells 17 μ , thin-walled. Rhizoids few, long, at the basal portion of the stem. Leaves contiguous. Keel

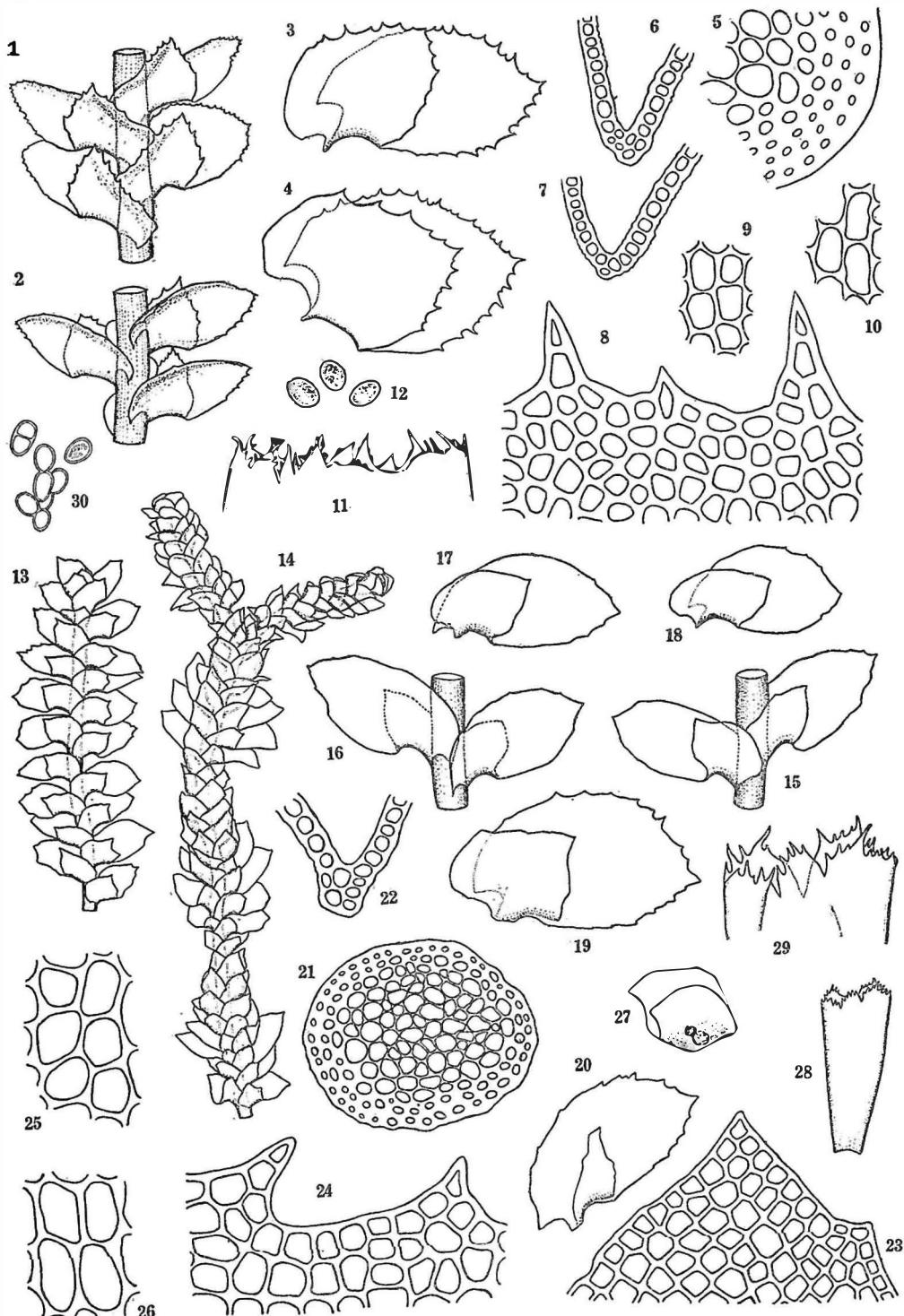
Text-fig. XII. *Scapania ampliata* Steph. (1–12)

1, Part of stem, dorsal view, $\times 16$. 2, Do., ventral v., $\times 16$. 3, 4, Leaves, $\times 25$. 5, Part of cross section of stem, $\times 285$. 6, 7, Cross sections of keel of leaf, $\times 150$. 8, Cells along leaf margin, $\times 285$. 9, Cells from leaf middle, $\times 285$. 10, Cells from leaf base, $\times 285$. 11, Perianth mouth, $\times 25$. 12, Gemmae, $\times 285$.

Scapania integerrima Steph. (13–30)

13, Sterile plant, dorsal v., $\times 10$. 14, Male plant, dorsal v., $\times 10$. 15, Part of stem, dorsal v., $\times 25$. 16, Do., ventral v., $\times 25$. 17–20, Leaves, $\times 25$. 21, Part of cross section of stem, $\times 150$. 22, Cross section of keel of leaf, $\times 150$. 23, Cells from leaf apex, $\times 285$. 24, Cells along leaf margin, $\times 285$. 25, Cells from leaf middle, $\times 285$. 26, Cells from leaf base, $\times 285$. 27, Male bract, $\times 25$. 28, Perianth, $\times 10$. 29, Mouth of perianth, $\times 25$. 30, Gemmae, $\times 285$.

Figs. 1–10, 12 were drawn from the specimen, *K. Mayebara* 1322, fig. 11 from *T. Kodama* 4632, figs. 13, 19, 20, 22, 24–26 from *T. Amakawa* 986, figs. 14–18, 21, 23, 27 from *Okamura* 267-isotype of *S. integerrima*, figs. 25, 28, 29 from *K. Okada* 39, fig. 30 from *T. A.* 1167. All drawn by T. Amakawa.



Text-fig. XII

0.2–0.3 the length of the ventral lobe, slightly concave dorsally, 1–3 cells thick dorsiventrally, wing usually wanting. Dorsal lobe nearly transversely inserted, not decurrent, somewhat appressed to the stem or in some case squarrose, obliquely quadrate to oval, 1/2–2/3 the ventral in size, width 0.7–0.8 the length, arching to 2/3 of the stem or up to the farther edge of it, apex obtuse with a point, often somewhat apiculate, margin almost entire to distantly denticulate. Ventral lobe nearly transversely inserted with the line of insertion moderately curved upwards on the stem and ending down more or less below the level of the keel, slightly decurrent, oblong-oval, 1–1.5 mm long, 0.5–1 mm wide (1/2–2/3 the length), apex subtriangular with an acute point, margin slightly recurved, nearly entire with some angular teeth or shortly dentate towards the apex, teeth 1–3 cells long, 1–2 cells wide, terminal cell longer than wide. Cells of the leaf apex (8)–10–17 μ , of the leaf middle 18–24 \times 12–18 μ , of the leaf base 34 \times 17 μ , walls equally thickened, trigones indistinct to small, rarely large. Cuticle smooth to more or less verrucose. Plants unisexual. Male inflorescence terminal or farther down; male bracts 4–6 pairs, smaller than the caudine leaves, saccate, antheridia 2–3 per bract. Perianth nearly campanulate, 1.7–2 mm long and 0.8 mm wide, dorsiventrally compressed, truncate, mouth with irregularly toothed lobes. Gemmae rare, ellipsoid, 18 \times 10 μ , 1–(2)-celled, green or occasionally reddish, in masses at the tip of stem.

Hab. Moist rocks and soil in the montane region, 500–1000 m. alt. Not common, known from south-western Japan.

Type loc. Kita-takimoto in Kochi County, Shikoku, Japan (*S. Okamura*).

Examinations: Honshu. Mie: *T. Magofuku* 364, *K. Okada* 3, 4, 34; Osaka: *K. O.* 22, 38, 39; Hyogo: Mt. Rokko, *M. Tuzibe* 2908. Shikoku. Ehime: Omogo, *S. Hattori* 5639; Kochi: Kita-takimoto, April 7, 1906, *S. Okamura* 267-isotype in Herb. Hattori Bot. Lab. Kyushu. Kumamoto: *K. Mayebara* 986, 2320; Miyazaki: Mt. Yahazu, *T. Amakawa* 981, 982, Mt. Mukabaki, *T. A.* 1167; Isl. Yakushima, *S. H.* 7376.

Range: Japan (Honshu, Shikoku, Kyushu).

The present species was recorded by Stephani (1910) basing on Okamura's collection. The authors recently proved more than ten collections to be identical with the present species. Consequently the range of *S. integerrima* extends from Shikoku to Kyushu and to M. Honshu. It occurs at rather lower elevations as *S. stephani*, and when marginal teeth appear on the leaves, this species may be likely mistaken for the latter species. The features for the separation of this from *S. stephani* are (1) more narrow ventral lobe of leaf with less dentate margin, (2) larger and quadrate leaf cells and (3) perianth mouth with spinose lobes.

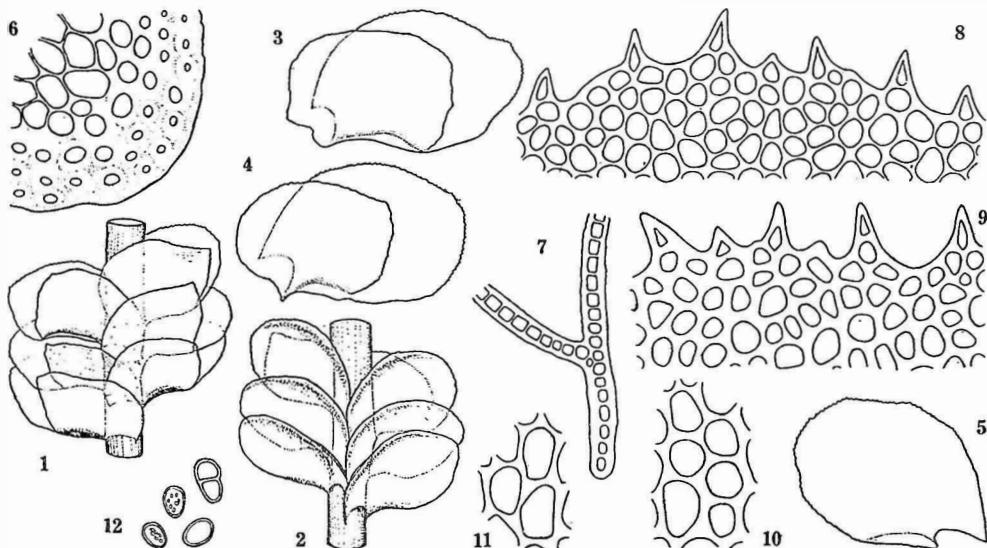
17. *Scapania okamurana* Steph. (in sched.), spec. nov.⁴⁾ (Text-fig. XIII)

Japanese name: Okamura-hishakugoke (nov.)

Plant 1–2 cm long, 1.5–2 mm wide, more or less stout, brownish, tinged with

4) Dioica, brunnescens. Caulis ascendens, 1–2 cm altus, parviromosus. Folia caulinata, parum oblique patula, ad medium inaequaliter biloba; lobus posticus obovatus, 0.8–0.9 mm longus, 0.8 mm latus, apice rotundatus, margine dense dentata, dentibus minutis, 1–(2) cellularibus; lobus anticus ovatus, caulem tegens; carina alata, ala conspicua, integerrima. Cellulas apicales 7–10 μ , mediac 14–20 \times 14–15 μ , basales 20–26 \times 12–15 μ , parietibus validis, cuticula parum verrucosa. Perianthia ignota. Gemmae fere unicellulares, flavo-brunneae.

red at the tip of the shoot, in patches. Stem 0.28 mm thick, brown, irregularly branched, ascending: in cross section the cortex clearly differentiated from the interior region; cortical cells in 2-3 layers, brown, $5-8 \mu$, walls as thick as cell-cavities; interior cells pale yellow, $20 \times 12 \mu$, thin walled. Rhizoids scarce, occurring on the lower portion of the stem. Leaves imbricate. Keel about half the length of the ventral lobe, slightly concave dorsally, wing conspicuous. Dorsal lobe transversely inserted, hardly decurrent, appressed to the stem, nearly rectangular, about $4/5$ the ventral in size, width 0.8-0.9 the length, arching to or slightly across the farther edge of the stem, apex rounded to obtuse, sometimes with a point.



Text-fig. XIII *Scapania okamurae* Steph. in sched.

1, Part of stem, dorsal view, $\times 16$. 2, Do., ventral v., $\times 16$. 3-5, Leaves, $\times 26$. 6, Part of cross section of stem, $\times 285$. 7, Cross section of keel of leaf, $\times 150$. 8, Cells of leaf apex, $\times 285$. 9, Cells along leaf margin, $\times 285$. 10, Cells of leaf middle, $\times 285$. 11, Cells of leaf base, $\times 285$. 12, Gemmae, $\times 285$. All figures were drawn from the type specimen by T. Amakawa.

Ventral lobe nearly transversely inserted with the line of insertion curved somewhat upwards on the stem, and ending down slightly below the level of the keel, little decurrent, oval to obovate, 0.8-0.9 mm long, 0.8 mm wide, apex rounded, margin finely dentate, teeth minute and dense, acute, longer than wide, 1-(2)-celled. Cells $7-10 \mu$ along the leaf margin, $14-20 \times 14-15 \mu$ in the leaf middle, $20-26 \times 12-15 \mu$ at the leaf base, walls moderately to strongly thickened, so that trigones rather indistinct. Cuticle weakly verruculose. Plants unisexual. Male inflorescence mostly intercalary, male bracts resembling the leaves. Perianth unknown. Gemmae usually 1-celled, yellowish brown, $14-17 \times 8-10 \mu$.

Hab. Ledge of granitic rocks, at low elevation.

Type loc. Okazaki, Aichi County, M. Japan (*S. Okamurae*).

Examination: Honshu. Aichi: Okazaki-machi (Inaguma), Nov. 17, 1912, *S. Okamurae* 355-type in Herb. Hattori Bot. Lab.

Range: Known only from the type locality.

Recently arranging the late Dr. S. Okamura's collection, the authors found a *Scapania* labelled as "*Scapania Okamurana* St.". As the late Stephani did so, they consider it to represent a new species. The leaves have conspicuous wing of keel, minute and dense marginal teeth, small cells with thick cell walls, and the gemmae are 1-celled, yellowish brown. This species seems to be a member of Sect. *Stephania*, but in some respects (such as yellowish brown color of gemmae) agrees with the members of Sect. *Nemorosae*.

Sect. *Nemorosae* (K. Müll.) Buch

18. *Scapania ampliata* Steph. (Text-fig. XII, 1-12)

Scapania ampliata Steph., Bull. Herb. Boiss. 5: 106 (1897); Inoue, Bot. Mag. Tokyo, 12: 74 (1898); 15: 182 (1901); K. Müll., Nova Acta Acad. Caes. Leop.-Carol. 83: 155, pl. 26a (1905); Yoshin., Bot. Mag. Tokyo, 20: 53 (1906); Steph., Spec. Hepat. 4: 149 (1910); Hatt., Bull. Tokyo Sci. Mus. 11: 68 (1944); Journ. Jap. Bot. 20: 162, f. 40 (1944); Bull. Yamagata Agr. Coll. 1: 42 (1949); Journ. Hattori Bot. Lab. 4: 51 (1950); 5: 79, pl. 6, 17-18 (1951); 8: 23 (1952); Journ. Jap. Bot. 27: 316 (1952); Oti, Shizen to Jimmon, 1: 66 (1950); Kamim., Contr. Hepat. Fl. Shikoku, 65 (1952). (Exsiccata) Hatt., Hepat. Jap. 3: 115 (1950).

Scapania iwakiensis Steph., Spec. Hepat. 6: 502 (1924); Kamim., l. c. 66 (1952).

Japanese name: O-himourokogoke (Yasuda, 1911); O-hishakugoke (Ihsiba, 1930); Iwaki-hishakugoke (Ihsiba, 1930, -*S. iwakiensis*).

Plant 2-4 cm long, 2 mm wide, greenish or yellowish brown, or sometimes reddish, in loose mats. Stem 0.2 mm thick, brown, simple, sometimes forked, ascending to erect: in cross section the cortex clearly differentiated from the interior region; cortical cells in 3-4 layers, brown, 5-8 μ , walls as thick as cell-cavities; interior cells 15 μ , walls thinner towards the center, trigones large. Rhizoids scattered towards the apex. Leaves contiguous to imbricate, almost the same in size throughout the shoot. Keel 0.3 the length of the ventral lobe, slightly concave dorsally, 2-3 cells thick dorsiventrally, wing wanting. Dorsal lobe obliquely inserted with the line of attachment curving down considerably below the level of the keel, squarrose, cordate to oval, about 3/4 the ventral in size, width 0.9 the length, arching across the farther edge of the stem, apex subacute to obtuse with a point, margin distantly dentate towards the apex, entire at the base. Ventral lobe nearly transversely inserted with the line of insertion curved moderately upwards on the stem and ending down about the level of the keel, decurrent, oval, 1-1.2 mm long, 0.7-0.9 mm wide (about 2/3-3/4 the length), apex subacute to obtuse with a point, margin coarsely dentate, teeth 1-3 cells long, 1-2 cells wide at base. Cells along margin of the ventral lobe 8-12 μ , walls rather equally thickened, of middle 14-19 \times 12 μ , trigones not large, rarely somewhat nodulose, of base 19-26 \times 8-12 μ , somewhat trabeculate. Cuticle more or less verrucose. Gemmae 1-celled, ellipsoid, 18 \times 12 μ , cinnamon brown. Plants unisexual. Perianth oblong, truncate 1.5-1.7 mm long, 1.3 mm wide, dorsiventrally compressed, mouth lobed, lobes with terminal and lateral teeth.

Hab. Thin humus or rock-faces and -crevices, sometimes on decayed wood and bases

of trees. Widely distributed and rather common in the montane-subalpine regions (more than 1000 m. alt.).

Type loc. Mt. Hayachine, Iwate County, N. Honshu, Japan (*U. Faurie*).

Examinations: **Honshu.** Aomori: Mt. Iwaki, *E. Uematsu*, -type of *S. iwakiensis* Steph. in Conserv. Bot. Geneve, Mt. Hakkoda, *U. Faurie* 1482, 1500; Yamagata: Mt. Hiuchi, *S. Hattori* 988-994; Fukushima: Oze, *S. H.* 652, Mt. Hiuchi, *S. H.* 653, 654; Gunma: *S. H.* 651; Tochigi: *Furusawa*; Tokyo: *S. Hattori* 3314; Niigata: Mt. Naeba, *K. Yagi*; Yamanashi: Mt. Koma, *K. Sakurai* 49; Nagano: Mt. Norikura, *U. Faurie* 1765, Nakabusa-Tsubakuro, *S. Hattori* 1382; Nara: Mt. Odaigahara, *T. Kodama* 4632, 4635, 4637. **Shikoku.** Ehime: Mt. Ishizuchi, *S. H.* 5026, 5029, 6074, 5078, 5081, 5093, 5112, 5117, 5287, 5507, 5828; Kochi: Mt. Kajigamori, *H. Inoue* 1002. **Kyushu.** Oita: Mt. Katamuki, *T. Amakawa* 805, *A. Noguchi*, Mt. Kuju, *T. A.* 902, Mt. Shaka, *T. Ono* 564; Kumamoto: Mt. Ichifusa, *K. Mayebara* 1322, 2355, 2356, 2479; Miyazaki: Mt. Takadake, *T. A.* 464, Mt. Kurumi, *T. A.* 470, Mt. Sobo, *T. A.* 664, 669, 671, Mt. Wanizuka, *Furusawa*; Kagoshima: Isl. Yakushima, *S. H.* 7651, 7629, 7696, 7700, 7707, 7715, 7717-7729, 7741, 7743, *T. Shin* 3890, 3900, *T. A.* 33, 69.

Range: Japan (Honshu, Shikoku, Kyushu).

The present species appears to represent *S. nemorosa* vicariously in Japan. *S. nemorosa* was recorded by S. Okamura (1915)⁵⁾ from southern Sakhalin (Notoro), but the authors cannot see that collection. The present species agrees with *S. nemorosa* in the degree of decurrence of the dorsal lobe, serration of the margin of leaves, and especially in its 1-celled, cinnamon-brown gemmae. The separation of the two species is that *S. ampliata* is smaller, its cell-walls of leaf margin are almost equally thickened, so that trigones are less conspicuous than *S. nemorosa*, and particularly that the perianth mouth of *S. ampliata* is divided into crowded and ciliate lobes.

Subgen. *Protoscapania* Amakawa et Hattori, subgen. nov.⁶⁾

Syn. *Scapania* "Cruppe *Planifolia*" K. Müll., Nova Acta Acad. Caes. Leop.-Carol. 83: 286 (1905).

Plants unisexual; large, robust, brownish green to almost brownish. Stem simple or branched: in cross section the cortex clearly differentiated from the interior region cortical cells in 3-5 layers, with very thick walls, often bastfiber-like. Leaves contiguous to imbricate, divided to the base into two unequal lobes. Keel absent. Dorsal lobe not or little decurrent, crossing the stem, divergent nearly parallel and often appressed to the stem, oval to nearly cordate, mostly with a point at apex, margin ciliate-dentate, teeth most developed at the base. Ventral lobe nearly transversely inserted with the line of insertion curved upwards on the

5) Okamura, Journ. Sci. Imp. Univ. Tokyo, 36: 3 (1915).

6) Dioica, magna, robusta. Stratum corticale brunneum, 3-5 cellulas crassum: cellulæ corticales valde incrassatae, internæ majores. Folia ad basim inaequaliter biloba, vix decurrentia, ciliato-dentata, dentibus basalibus longioribus. Commissura nulla. Lobus anticus oviformis vel cordatus, cauli subparallelus. Lobus posticus duplo vel triplo major, oviformis, subhorizontale patulus. Cellulæ foliorum validæ, parietibus incrassatis, trigonis magnis, nodulosis, itaque±asteriae. Perianthium oblongum, compressum, truncatum, ore ciliato. Gemmae bicellulares.

stem and ending down about the level of the segment, not or little decurrent, nearly horizontally spreading, 2-3 times as long as the dorsal lobe, ovate, apex often with point, margin ciliate-dentate, teeth 2-3 cells long, 1-(2)-cells wide. Cells of the leaves more or less stellate with bulging trigones. Cuticle nearly smooth to verrucose. Gemmae 2-celled. Perianth terminal, oblong, truncate, dorsiventrally compressed, mouth irregularly dentate to ciliate.

Type: *Scapania secunda* Steph.; K. Müll., l. c. 83: 291, pl. 27b (1905).

H. Buch (1928) included K. Müller's "Gruppe *Planifolia*" into Subgen. *Plicatocalyx*.⁷⁾ However, soon after his publication Nicholson (1930) found the perianth of *S. secunda* Steph., a member of *Planifolia*. The perianth is not cylindrical nor plicate, according to Nicholson (1930). Therefore "Gruppe *Planifolia*" is not to be included into *Plicatocalyx*. The authors wish to propose a subgeneric name, *Protoscapania*, for Müller's "Gruppe *Planifolia*," designating *S. secunda* as the type instead of *S. ornithopodioides* whose perianth is yet unknown.

The present subgenus comprises (1) *Scapania secunda* Steph., (2) *S. ornithopodioides* (With.) Pears., (3) *S. nimbosa* Steph., (4) *S. handellii* Nichols., (5) *S. rotundifolia* Nichols. and (6) *S. ciliatospinosa* Horik.

19. *Scapania ornithopodioides* (With.) Pears. (Text-fig. XIV)

Scapania ornithopodioides (With.) Pears., Hepat. Brit. Isl., 219 (1900); Macv., Stud. Handb. Brit. Hepat. (ed. 2) 381 with fig. (1926); Buch, Soc. Sci. Fenn., Comm. Biol. 3-1: 161, f. 36 (1928); Hatt., Journ. Jap. Bot. 19: 119, f. 19 (1943); 27: 55 (1952); Journ. Hattori Bot. Lab. 8: 24 (1952); Kamim., Acta Phytotax. Geobot. 24: 112 (1952).

Jungermannia ornithopodioides With., Bot. Arrang., 2: 695 (1776).

Jungermannia planifolia Hook., Brit. Jungerm. 17, pl. 67 (1814).

Scapania planifolia Dum., Rec. d'Obs., 14 (1835); Mitt., Journ. Linn. Soc. Bot. 5: 101 (1861); K. Müll., Nova Acta Acad. Caes. Leop.-Carol. 83: 286, pl. 43 (1905); Steph., Spec. Hepat. 4: 136 (1910); K. Müll. in Rabenh., Krypt.-Fl. (ed. 2) 6-2: 519 with fig. (1915); Nichols. in Mazzetti, Symb. Sinic. 5: 30 (1930); Chopra, Proc. Ind. Acad. Sci. 8: 436 (1938).

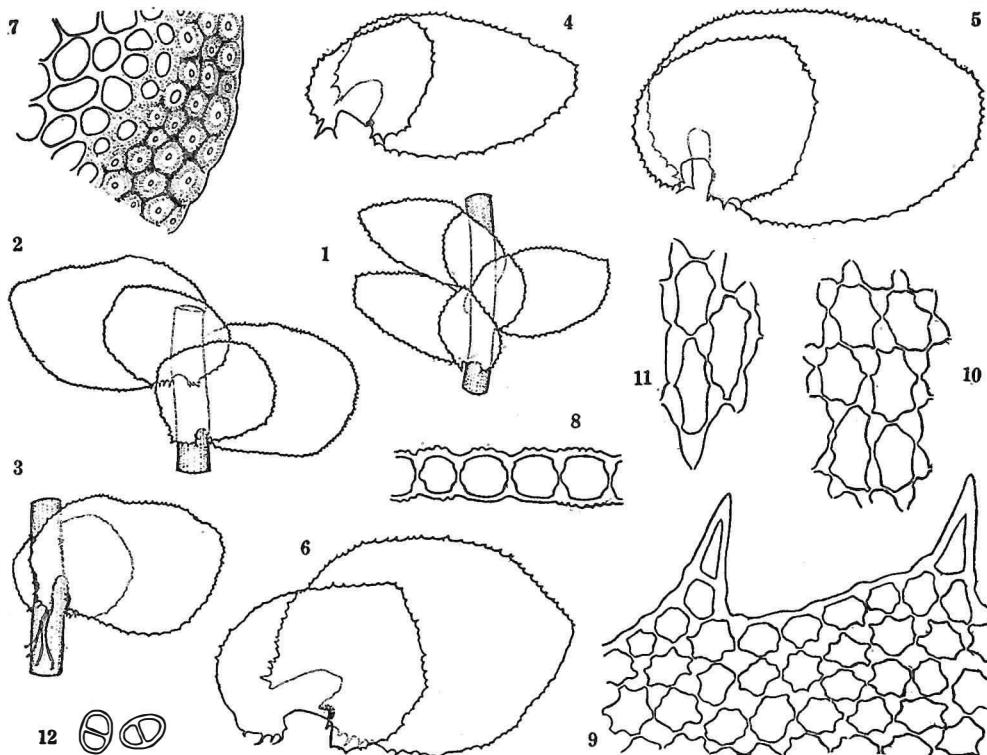
Scapania plagiochiloides Horik., Journ. Sci. Hiroshima Univ. B, 2, 1: 83, f. 7 (1932); 2: 222 (1934) -syn. nov.

Japanese name: Mukashi-hishakugoke (Hattori, 1943).

Plant about 7 cm long, 3-4 mm wide, olive-green to brownish, in large patches. Stem 0.3-0.4 mm thick, brown, usually simple, rarely innovating new shoot from the apex: in cross section the cortex clearly differentiated from the interior region; cortical cells in 3-4 layers, brown, $5 \times 2.5 \mu$, radially compressed, walls 3 times as thick as the cell-cavities, bastfiber-like; interior cells pale, 17μ , thin walled. Rhizoids rather scarce, long, colorless, scattered upwards to near tip of the stem. Leaves contiguous to somewhat imbricate, divided to the base into two unequal lobes. Keel absent. Dorsal lobe inserted with the line of attachment slightly curved upwards on the stem and ending down about the level of the segment,

7) Subgen. *Plicatocalyx* (K. Müll.) Buch (excluding Müller's 'Gruppe *Planifolia*') seems to be rather of generic rank, as its perianth is cylindrical, not dorsiventrally compressed, longitudinally plicate but not so contracted as *Diplophyllum* and densely ciliate at the mouth.

somewhat auriculate at base, divergent nearly parallel and appressed to the stem, cordate roundish quadrate, 1/2-3/5 the ventral in size, width 1-1.2 the length, arching across the farther edge of the stem, apex obtuse often with a point, margin spinose-dentate, at base spinose-ciliate (tending to somewhat compound-ciliate). Ventral lobe nearly transversely inserted, with the line of insertion curved distinctly upwards on the stem and ending straightly down somewhat below the level of the segment, decurrent, nearly horizontally spreading, flat or slightly convex, oblong



Text-fig. XIV *Scapania ornithopodioides* (With.) Pears.

1, 2, Parts of stem, dorsal v., $\times 10$. 3, Do., ventral v., $\times 10$. 4-6, Leaves, $\times 25$. 7, Part of cross section of stem, $\times 285$. 8, Part of cross section of leaf, $\times 285$. 9, Cells along leaf margin, $\times 285$. 10, Cells from leaf middle, $\times 285$. 11, Cells from leaf base, $\times 285$. 12, Gemmae, $\times 285$. Figs. 1-5, 7-11 were drawn from the specimen, T. Kodama 4639, figs. 6, 12 from A. Noguchi's collection. All drawn by T. Amakawa.

to ovate, 1.7-2.3 mm long, 1-1.7 mm wide (4/7-2/3 the length), apex rounded to obtuse with a point, margin coarsely spinose-dentate (teeth 1-2 cells long), at base spinose-ciliate. Cells along margin of the ventral lobe of leaf $14-17 \mu$, of middle $26 \times 14 \mu$, of base $26-34 \times 14 \mu$, stellate, trigones bulging, here and there coalescent near margin, somewhat trabeculate at base. Cuticle nearly smooth to more or less verrucose. Gemmae 2-celled, walls thick and brown, $20 \times 14-16 \mu$. Perianth unknown.

Hab. Crevices of chert and other Paleozoic rocks. Disjunctively found in six mountains, 700-2500 m. alt., in our area.

Type loc. European.

Examinations: Honshu. Tokyo: Okutama -mitake, ca. 700 m. alt., *S. Hattori*; Saitama: Mt. Ryogami, ca. 1600 m. alt., *D. Shimizu*, Shiroiwa in Chichibu Mts., *I. Nagano*; Yamanashi: Mt. Koma, *K. Sakurai* 53; Nara: Mt. Odaigahara, *T. Kodama* 4639, 4640. Shikoku. Kochi: Mt. Kajigamori, *H. Inoue* 15, 846, *T. Yamanaoka* 341.

Range: Japan (Honshu, Shikoku), Europe, Himalaya, Yunnan, Hawaii. New to Formosa!

The present species shows disjunctive distribution. The first record in Japan is that of S. Hattori (1943) who referred his collection at Mitake, Tokyo. The second (Hatt. 1952) is from Mt. Kajigamori in Kochi Co. Here the authors add four localities. All the localities belong to Paleozoic mountain blocks.

Noguchi's collection made in Formosa (Mt. Arisan) well agrees with the description and figures of *S. plagiochilooides* Horik. which is to be identical with the present species.

Correction

The authors proposed *Scapania pilifera* as a new species closely related to *S. mucronata*, basing on two collections made by S. Hattori at Mt. Tsubakuro in Japanese N. Alps. Afterwards, however, comparing carefully the original material to the authentic European and N. American collections of *S. mucronata*, they found that *S. pilifera* should be conspecific with the latter species.

Scapania mucronata Buch, Medd. Soc. Fauna Fl. Fennica 42: 91 f. 6, 9 (1916); Soc. Sci. Fenn., Comm. Biol., 3 (1): 63, f. 14 (1928); Frye & Clark, Hepat. N. America, 4: 603, f. 1-11 (1946).

Scapania pilifera Amakawa et Hattori, Journ. Hattori Bot. Lab. 9: 60, f. 6, 17-25 (1953), -syn. nov.

Examinations: Amakawa & Hattori, l. c.

Range: Europe, Siberia (Ob, Jenissei, Amur), Greenland, N. America. New to Japan!

ON THE FILAMENTOUS APPENDAGE, A NEW FINE STRUCTURE
OF THE SPERMATOZOID OF *CONOCEPHALUM CONICUM*
DISCLOSED BY MEANS OF THE ELECTRON MICROSCOPE¹⁾

By Syôiti SATÔ²⁾

佐藤正一： ジヤゴケ精子に見出された新しい構造、 繊維状附属物の
電子顕微鏡的研究（予報）

In a series of studies upon the spermatozooids of plants by means of the electron microscope, the author recently observed in *Conocephalum conicum* a filamentous appendage, a long tape-like structure along the body of the spermatozoid under the electron microscope. This filamentous appendage has not been detected in vital or in fixed spermatozooids. Fig. 1 shows a spermatozoid fixed with vapour of 2 per cent osmium tetroxide solution. It consists of two flagella and a body, and the latter consists of three parts; i.e., the blepharoplast, the nuclear portion and the cytoplasmic portion (bended portion). These portions, in the specimens fixed either with osmium tetroxide vapour or with 4 per cent neutral formalin, which are the usual suitable fixatives for preparations for the electron microscope, are opaque to the electron beam, and details in them could scarcely be detected.

The internal structure of the body, however, was made partially clear in the specimens treated with such adequate agents, as hot water, vapour of ammonium, vapour of chloroform, or ultrasonics. When the specimen was treated with a hot water, a long filamentous appendage appeared apart from the ghost image of the body which has been dispersed (Fig. 3). In the upper left corner of Fig. 3, is there the blepharoplast (B) from which extend two undestroyed flagella (C) and a tape-like filamentous appendage (A). The latter stretches across the figure diagonally and the destroyed body of the spermatozoid remains as curved ghost (D). In the ghost many fine fibers loosely woven remained in the nuclear portion. This appearance is also interesting, and it will be reported in the future. The filamentous appendage can be seen in an unfixed specimen. One of such figures is shown in Fig. 2; where the filamentous appendage (A) has just separated from the body which suffered no destruction except the cytoplasmic portion (E). It seems quite probable that the filamentous appendage originates from the blepharoplast and forms a long tape, about 0.2μ in the width, and attaches to the one side of the body lengthwise.

This filamentous appendage disintegrates into many fine fibrils in a strong treatment of hot water (Fig. 4) or ultrasonics (Fig. 5). Each fibril is about $20 m\mu$ in diameter. The number of fibrils is nine in Fig. 4 and ten in Fig. 5, but it should be constant and this will be determined in future. It is a difficult problem to say whether this filamentous appendage exists in the center of the body or lies along the length of the body. The nature and the function of this organ is now under investigation.

1) Contributions from the Divisions of Cytology and of Genetics, Botanical Institute, Faculty of Science, University of Tokyo, No. 356.

2) Division of Genetics, Botanical Institute, Faculty of Science, University of Tokyo.

A similar filamentous appendage was also found in the spermatozoid of *Marchantia polymorpha*, when treated with a hot water. The present author assumes that the presence of the filamentous appendage will be one of the useful characteristics in classifying the spermatozoids of the Bryophyta.

I wish to thank Dr. N. Tanaka and Dr. A. Yuasa of Tokyo University and Dr. S. Hattori of the Hattori Botanical Laboratory for suggesting this work and their interest in this problem and Mr. S. Sakata of Tokyo University for taking the electron micrographs used in this paper. This work was partially supported by a research grant from the Fuju-kai Research Encouragement Fund.

Explanation of Plate

Electron micrographs of spermatozoids of *Conocephalum conicum*. Chrome shadowed. A: Filamentous appendage, B: Blepharoplast, C: Flagellum, D: Nuclear portion, E: Cytoplasmic portion.

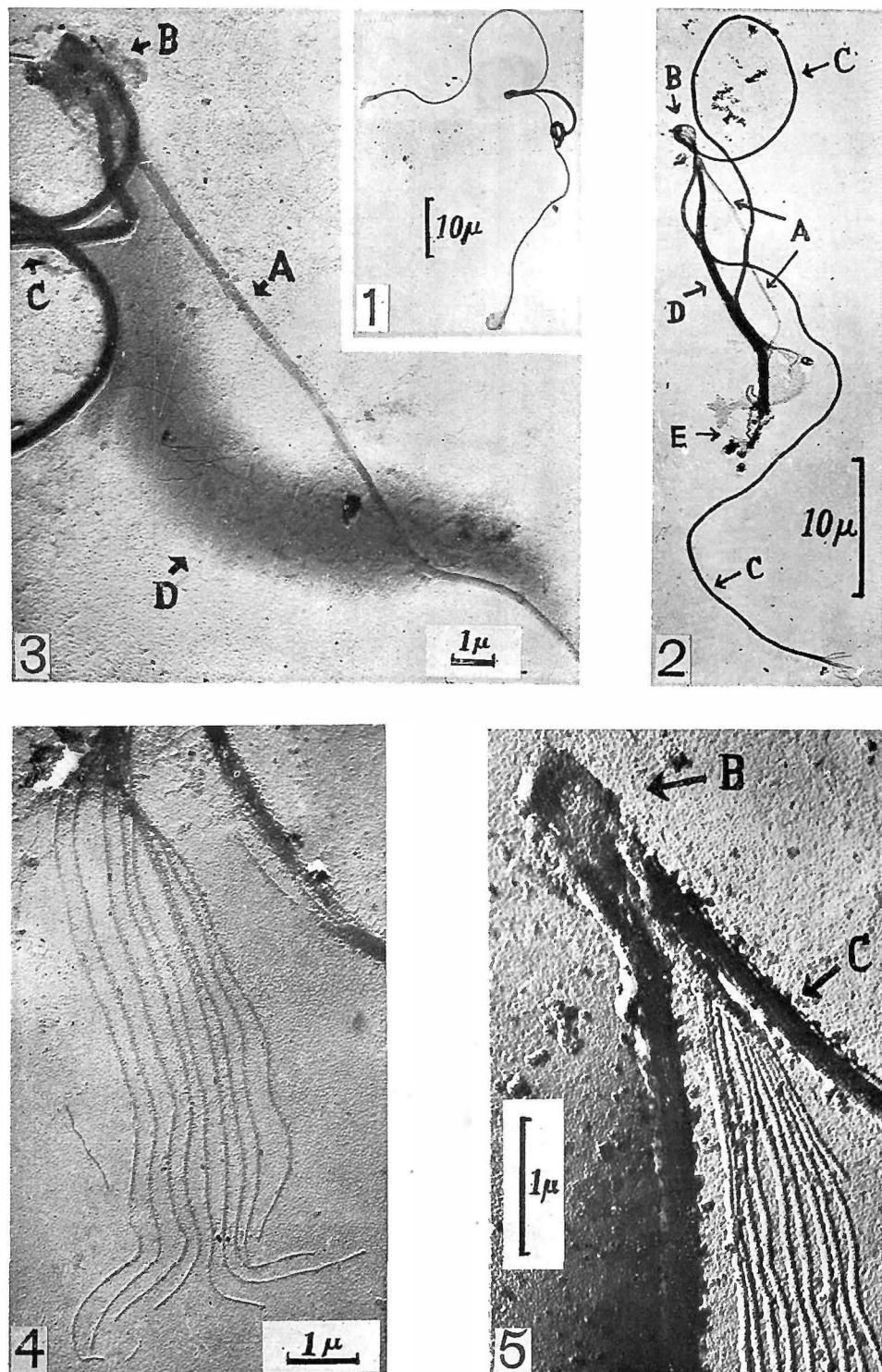
Fig. 1. Fixed with vapour of 2 per cent osmium tetroxide.

Fig. 2. Unfixed spermatozoid. A filamentous appendage (A) separates from the body.

Fig. 3. Treated with a hot water. A filamentous appendage (A) remained along the ghost. In the dispersed nuclear portion (D) many fine fibers remain.

Fig. 4. Treated with a hot water. The filamentous appendage disintegrated into nine fine fibrils.

Fig. 5. Treated with ultrasonics. The filamentous appendage disintegrated into ten fine fibrils. Notice that the filamentous appendage originates from the blepharoplast.

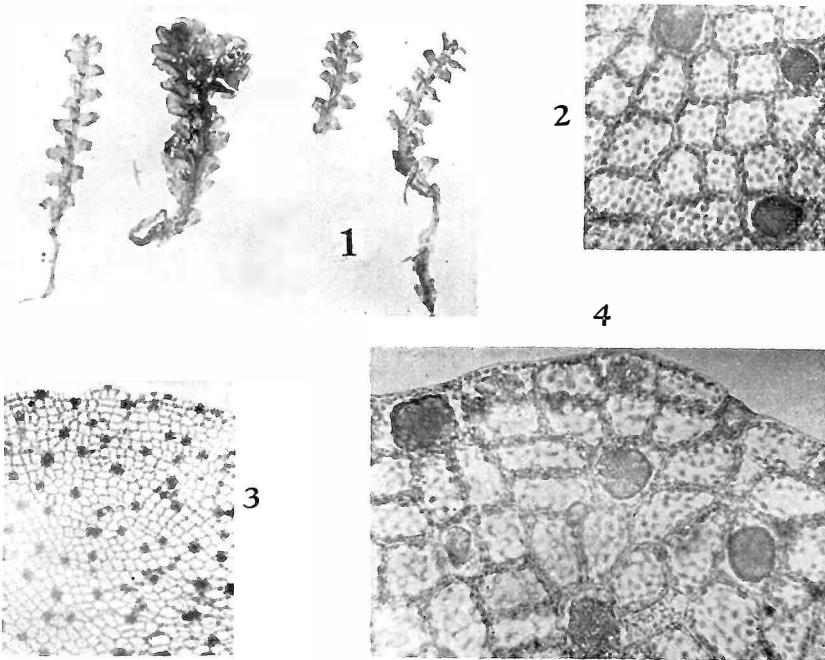


ON THE OIL-BODIES OF TREUBIA NANA

By Hiroshi INOUE and Sinske HATTORI

井上浩、服部新佐：ヒメトロイブゴケの油体について

In the preceding number of this journal we described *Treubia nana*, a new species of *Treubiaceae*. The material used, however, was a dried one and not fresh. Recently H. Inoue, one of the authors, visited the Karisaka pass of Chichibu Mts., the type locality, and recollected this interesting liverwort to study in fresh condition.¹⁾ The oil-bodies of living plants are not so large as oil-cells are filled with them, and many chloroplasts are visible, mostly touching to thin cell walls as dark spots (Figs. 2, 4). The oil-body type of this species and of *T. insignis* is just the same, and differs from that of all other liverworts.



Treubia nana. Fig. 1. Plants, \times ca. 1.3. Fig. 2. Cells from thallus lobe, \times ca. 500. Fig. 3. Marginal portion of dorsal scale, \times ca. 100. Fig. 4. Do., \times ca. 500. From living plants collected, June, 1954. H. Inoue photo.

1) This species seems to be very rare. In spite of his intensive search, H. Inoue could collect only some 15 sterile shoots of this liverwort at the type locality, and not elsewhere. They are mostly prostrate on a cushion of *Hylocomium proliferum* beneath coniferous woods.

251. *Anthelia juratzkana* (Limpr.) Trev. (Ptilidiaceae) ヒメカサナリゴケ 長野県南アルプス仙丈ヶ岳 (高山帶の裸地~岩隙). 252. *Aste ella chichibuensis* Shim. et Hatt. (Rebouliaeae) チヂブサイハイゴケ 埼玉県秩父郡大滝村落合 (岩隙~地上). 253. *Athalamia glauco-virens* Shim. et Hatt. fo. *subsessilis* Shim. et Hatt. (Sauteriaceae) グンバイゼニゴケの1品種埼玉県大滝村上中尾 (岩壁, 岩隙). 254. *Bazzania fauriana* (Steph.) Hatt. (Lepidoziaceae) フォーリムカデゴケ 鹿児島県屋久島 (花崗岩上の腐植). 255. *Bazzania fissifolia* var. *sub-simplex* (Steph. in sched.) Hatt. ホソムチゴケ 長崎県北相木村御座山 (硅岩崖). 256. *Bazzania japonica* (Sde. Lac.) Lindb. ヤマトムカデゴケ 宮崎県南那珂郡酒谷村 (林下の岩上). 257. *Bazzania trigona* Hatt. ヤマムチゴケ 長崎県経ヶ岳 (湿岩壁). 258. *Microlepidozia makinoana* (Steph.) Hatt. (Lepidoziaceae) スギバゴケ 長崎県雲仙岳 (山道側, 土崖). 259. *Cephalozia lammersiana* var. *innovata* Amak. (Cephaloziaceae) ササキヤバネゴケ 長野県八ヶ岳夏沢峰 (コメツガ林下の小流辺, 湿土上). 260. *C. otaruensis* var. *acrogyna* Amak. オーギヤマトヤバネゴケ 大分県久住山, 白口岳北面 (樹下の湿岩). 261. *Drepanolejeunea foliicola* Horik. ヨージョークサリゴケ 宮崎県酒谷村 (溪流上のタラヨウ葉上). 262. *Euosmolejeunea obtusifolia* (Steph.) Hatt. マルバカギウロコゴケ 福岡県英彦山 (神社の石垣, 隠湿所). 263. *Frullania motoyana* Steph. (Frullaniaceae) チャボヤスデゴケ 熊本県球磨郡神ノ瀬 (松の樹皮). 264. *F. taradakensis* Steph. タラダケヤスデゴケ 福岡県古延山 (石灰岩). 265. *Heteroscyphus bescherellei* var. *transiens* Hatt. (Lophocoleaceae) ナンゴクオーウロコゴケ (新称) 宮崎県南那珂郡酒谷村 (硬砂岩の湿崖). 266. *Jubula hutchinsiae* subsp. *japonica* (Steph.) Hatt. (Frullaniaceae) ヒメウルシゴケ 宮崎県南那珂郡酒谷村 (硬砂岩質陰湿崖). 267. *Jungermannia hiugaensis* Amak. -isotype (Jungermanniaceae) ヒューガウロコゴケ (新称) 宮崎県東臼杵郡大崩山 (湿った花崗岩). 268. *J. senjoensis* Amak. (isotype) センデューウロコゴケ (新称) 長野県南アルプス仙丈ヶ岳 (硬砂岩の湿崖). 269. *Lepidozia subtransversa* Steph. (Lepidoziaceae) ミヤマスギバゴケ 長野県木曾御嶽 (コメツガ帶の岩~地上). 270. *Lepciolella lanciloba* (Steph.) Evs. (Lejeuneaceae) オーヨージョーゴケ (葉上). 271. *Lophocolea heterophylla* (Schrad.) Dum. (Lophocoleaceae) トサカゴケ 熊本県人吉市 (倒腐木). 272. *Lophozia cornuta* (Steph.) Hatt. (Jungermanniaceae) オヤコゴケ 福岡県英彦山 (腐木). 273. *L. fauriana* Steph. フォーリイチヨーゴケ 岐阜県乗鞍岳北面, 平湯 (倒腐木). 274. *Mannia barbifrons* Shim. et Hatt. (Rebouliaeae) ヒゲゼニゴケ 愛知県北設楽郡富山村, 天竜川中流 (陽地の石垣の間). 275. *Marsupella parvitexta* Steph. (Marsupellaceae) コアミミゾゴケ 福岡県英彦山, 北岳頂上 (ブナ林内の岩上). 276. *Mastigophora diclados* (Brid.) Nees (Ptilidiaceae) オーサワラゴケ 鹿児島県屋久島小杉谷 (樹幹). 277. *Nipponolejeunea pilifera* (Steph.) Hatt. (Lejeuneaceae) ケシゲリゴケ 長崎県雲仙岳 (樹皮). 278. *Peltolepis quadrata* var. *japonica* Shim. et Hatt. (Sauteriaceae) ヤツガタケゼニゴケ 長野県八ヶ岳 (針葉樹帶上限部の湿つた集塊岩). 279. *Plagiochasma intermedium* Lindb. et Gott. (Rebouliaeae) ミカンゴケ 熊本県球磨郡一勝地 (岩上, 石灰岩に非ず). 280. *Plagiochila furcifolia* Mitt. (Plagiochilaceae) ヤハズハネゴケ 福岡県太宰府神社社叢 (老樹幹~根もと). 281. *Plagiochila dentosa* Hatt. (= *Pl. hokkodensis* var. *dentosa* Hatt.) タカネハネゴケ 埼玉県秩父郡三宝山 (シラベ, トウヒ林下の花崗岩). 282. *Pl. hokkodensis* Steph. ミヤマハネゴケ 山梨県八ヶ岳, 権現岳 (稜線に近い小流畔の湿岩). 283. *Pl. rhizophora* Hatt. ヒゲネハネゴケ 埼玉県秩父郡三国峠 (湿硬砂岩). 284. *Pl. satoi* var. *integerrima* Hatt. (isotype) ハナシヒメハネゴケ (新称) 埼玉県秩父山地, 甲武信岳 (小流畔の湿岩). 285. *Pl. shimiizuana* Hatt. (isotype) シミズハネゴケ (新称) 山梨県蘆安村宏河原峠 (コメツガ, トウヒ林の輝緑凝灰岩). 286. *Porella gracilima* Mitt. (Porellaceae) ホソクラマゴケモドキ 宮崎県鞍岡村白岩山 (石灰岩). 287. *Porella grandiloba* Lindb. オータクラマゴケモドキ 長野県北相木村御座山 (河岸の角岩). 288. *Porella perrottetiana* (Mont.) Hatt. ケクラマゴケモドキ 福岡県英彦山 (陰湿岩上). 289. *Porella takakii* Hatt. タカキクラマゴケモドキ 宮崎県鞍岡村白岩山東斜面 (樹幹~根もと). 290. *Ptilidium californicum* var. *multispinum* Hatt. -isotype (Ptilidiaceae) ハイマツテガタゴケ (新称) 山梨県騎城村あさよ峰 (ハイマツ樹皮). 291. *Radula amentulosa* Mitt. (Radulaceae) チャケビラゴケ 山梨県蘆安村左股沢上部 (粘板岩の岩壁). 292. *Radula kojana* Steph. コーヤケビラゴケ 熊本県人吉市 (岩上). 293. *Radula valida* Steph. オーケビラゴケ 福岡県英彦山 (陰湿岩上). 294. *Riccardia decrescens* (Steph.) Hatt. (Riccardiaceae) アワスジゴケ 熊本県人吉市 (湿岩). 295. *R. submersa* Horik. ツクシテングサゴケ 愛知県北設楽郡茶臼山 (林内溪流の岩上, 沈生). 296. *Riccia nipponica* Hatt. (Ricciaceae) カンハタケゴケ 宮崎県日南市および本町 (粘土質の地上). 297. *Scapania integrerrima* Steph. (Scapaniaceae) ハナシヒシャクゴケ 宮崎県行藤山 (湿つた花崗岩). 298. *Taeniolejeunea ocelloides* (Horik.) Hatt. (Lejeuneaceae) クチバシショージョーゴケ 熊本 市房山 (杉の樹皮). 299. *Trichocoleopsis sacculata* (Mitt.) Okam. (Ptilidiaceae) ビロードゴケ 長崎県雲仙岳 (腐木). 300. *Tuyamaella molischii* (Schiffn.) Hatt. (Lejeuneaceae) モーリッシュシゲリゴケ 熊本県人吉市 (樹皮).

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