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財 団 法 人

服 部 植 物 研 究 所

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本研究所評議員小玉定一氏は昭和29年9月8日逝去されました
茲に謹んで哀悼の意を表します

本研究所評議員松井良平氏は7月24日逝去されました 茲に 謹んで哀悼の意を表します

RESEARCHES ON THE BRACHYTHECIACEAE OF JAPAN AND ITS ADJACENT AREAS. II.

By Noriwo TAKAKI¹⁾

高木典雄：日本及び近接地域産ヒツジゴケ科群類の研究 II.

Brachythecium Bryol. Eur. fasc. 52-54 (1853)

In this genus, K. Sakurai recorded in his "Muscologia japonica" 50 species, 24 varieties and 2 forms as occurring in Japan. In total, we have now about 55 species, 31 varieties and 2 forms in the whole area under consideration. This number, however, includes many questionable and not thoroughly investigated taxa. The author has tried to adjust this situation and added 7 new species to our previous knowledge. In the present revision, thus, 39 species, 18 varieties are recognized in our area.

The general characters of this genus are as follows: Plants usually of medium size, with the hypnaceous habit. Leaves acute or slenderly acuminate (never obtuse at the apex), usually somewhat concave and often plicate or sulcate; costa single, extending more than the half way or often reaching the apex; median leaf-cells linear-rhomboidal, rarely widely rhomboidal, becoming laxer towards the base, alar cells quadrate or inflated and hyaline. Seta smooth to very rough. Capsules shortly ovoid to oblong-ovoid, arcuate, inclined or horizontal, rarely erect, cylindrical. Operculum conic to short rostrate. Peristome perfect. Monoicous or dioicous.

This genus is classified in this monograph 7 sections, mainly following Brotherus' system in the "Pflanzenfamilien (1925)."

Key to the sections

- | | | | |
|---|---|---|------------------------|
| 1 | { | Seta throughout smooth | 2 |
| | { | Seta throughout rough | 4 |
| | { | Seta rough above, nearly smooth below | <i>Cirriphyllopsis</i> |
| 2 | { | Capsules cylindrical, erect or very slightly curved | <i>Acuminata</i> |
| | { | Capsules arcuate, inclined | 3 |
| 3 | { | Medium in size; leaves usually plicate | <i>Salebrosa</i> |
| | { | Minute in size; leaves scarcely or not plicate | <i>Julacea</i> |
| 4 | { | Leaves spreading and reflexed when dry | <i>Reflexa</i> |
| | { | Leaves not reflexed when dry | 5 |
| 5 | { | Medium to robust in size | <i>Rutabula</i> |
| | { | Minute in size | <i>Velutina</i> |

Sect. *Acuminata* Grout in Mem. Torr. Bot. Club 6: 163 (1897)

This section is closely allied in many respects to the sect. *Salebrosa*, differing, however, in having erect and cylindrical capsules, low membrane with rudimental cilia and lacking annulus. Hitherto no species of this section has been reported from the present area.

1) Biological Institute, Faculty of Culture, Nagoya University, Mizuho-ku, Nagoya-shi, also Hattori Botanical Laboratory, Nichinan-shi, Miyazaki Pref.

1. *Brachythecium formosanum* Takaki sp. nov. (Fig. 8)

Dioicum, gracile, caespitosum, caespitibus valde densis, rigidiusculis, flavo-vel sordide viridibus, nitidiusculis. Caulis repens, ad 5 cm longus, hic illic fusco-radiculosus, laxiuscule foliosus, ramis erectis vel adscendentibus, ca. 0.5–1.0 cm longis, dense foliosis, simplicibus, cum foliis ca. 1 mm latis, attenuatis. Folia sicca subadpressa humida haud mutata. Folia caulina e basi ovata sensim longe et acute acuminata, parce decurrentia, 2.3–2.5 mm longa et 1.1 mm lata, valde concava, plicatula; nervo tenui, 2/3 folii evanido; marginibus inferne plus minus recurvis, supra medium minute serrulatis; cellulis medianis rhomboideis vel anguste rhomboideis, $52-58 \times 6.4-8.1 \mu$, levibus, basilaribus laxioribus, oblongo-hexagonis, alaribus pellucidissimis, quadratis vel rotundatis. Folia ramea foliis caulinis similia. Bractee perichaetii internae oblongo-lanceolatae, in acumen sensim elongatum piliferum attenuatae, ca. 2.7 mm longae et basi 0.53 mm latae, nervis indistinctis; paraphysibus paucis. Seta tenuis, 1.5–1.8 cm longa, stricta vel leviter curvata, rubra, laevissima. Theca symmetrica vel paulum asymmetrica, oblongo-cylindrica, 2–2.5 mm longa et 0.52 mm crassa, stricta vel plus minus curvatula. Operculum e basi conica brevissime rostratum, ca. 0.82 mm altum. Peristomium duplex, exostomii dentes basi connati, lanceolato-subulati, 0.65 mm longi et 0.14 mm lati, lutei, e medio ad apicem hyalini et papilloso, anguste hyaline limbati; processus minutissime papillosus, carinatus, in carina rimosus; corona basilaris 0.19 mm alta; cilia 1, bene evoluta hyalina, papillosa, 0.43 mm longa. Sporae lutescentes, minute papillosae, ca. 17μ magnae. Calyptra ignota.

Specim. exam.: **Formosa**. Prov. Taichū: Rakuraku A. *Noguchi* 7061—Holotype, Aug. 21, 1932; Taikwan A. *Noguchi* 6037, Aug. 21, 1932.

Range: Formosa.

The genus *Chamberlainia*²⁾ was established by Grout being separated from the *Brachythecium* by its erect, cylindrical capsules and lack of cilia in the peristome. By the examination of an American specimen of *Ch. acuminatum* (Hedw.) Grout, the author observed that this new species resembles it in many respects, but differs in its smaller size and in having well developed cilia. By the presence of such cilia, this new species may be classed to the *Brachythecium*, not to *Chamberlainia*. This new species seems to stand on the connecting point between both genera.

Sect. *Salebrosa* Limpr. Laubm. 3: 62 (1895)

Medium to robust in size. Branches usually terete-foliate with densely or loosely imbricate leaves. Leaves slenderly acuminate, plicate (often strongly so), concave; costa 2/3 length of leaf in most cases, stout at base but rapidly getting thin upwards; median leaf-cells linear-fusiform, areolation gradually becoming larger and looser towards the base and forming larger pellucid area at the base of leaf. Seta smooth throughout. Capsules oblong-cylindric, arcuate. The smooth seta and loose areolation of basal part of leaf seem to be the most remarkable characters.

Key to the species

- | | | |
|-----|--|---|
| 1 { | Costa extending to or below the apex | 2 |
| 1 { | Costa extending 1/2–2/3 length of leaf | 3 |

2) Moss Flora of North America, 3: 27 (1928).

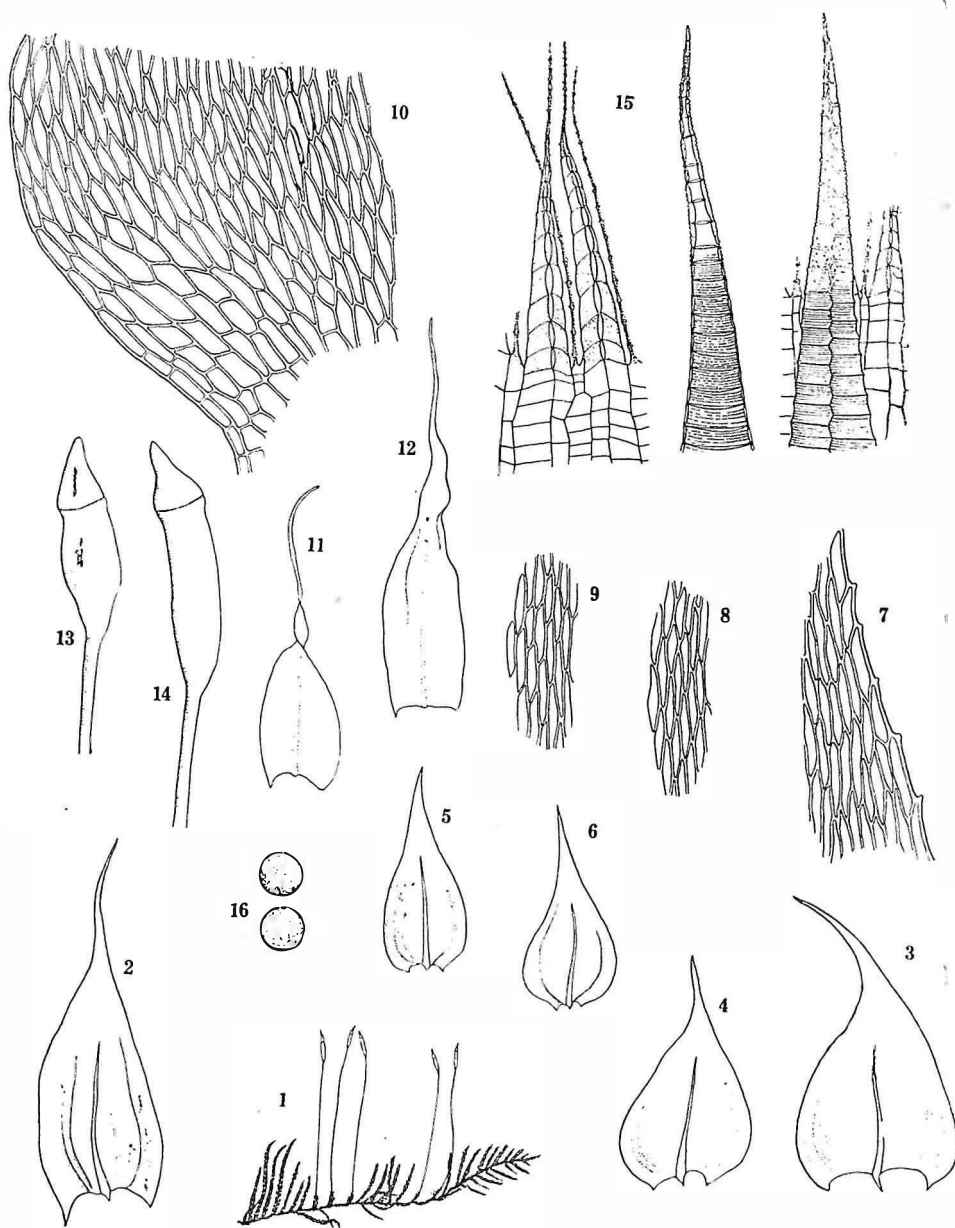


Fig. 8. *Brachythecium formosanum* Takaki

1. Plant ($\times 1$). 2, 3, 4. Stem leaves ($\times 19$). 5, 6. Branch leaves ($\times 19$). 7. Marginal part of stem leaf ($\times 217$). 8. Median cells of stem leaf ($\times 155$). 9. Median cells of branch leaf ($\times 155$). 10. Basal angle of stem leaf ($\times 155$). 11, 12. Perichaetial bracts ($\times 19$). 13, 14. Capsules ($\times 12$). 15. Peristome teeth ($\times 93$).

- 2 { Stems irregularly branched; loosely areolated area of leaf base
widely extended *B. camptothecioides*
- 2 { Stems regularly and pinnately branched; the same area restricted
at the extreme base..... *B. pinnatum*
- 3 { Leaves suddenly contracted into a long pointed acumen *B. helminthocladum*
- 3 { Leaves gradually and slenderly acuminate..... 4
- 4 { Operculum convex, not rostrate *B. nakajimae*
- 4 { Operculum shortly rostrate 5
- 5 { Seta sometimes rough above, nearly smooth below;
somewhat complanately foliate *B. campestre*
- 5 { Seta always smooth; round foliate 6
- 6 { Capsules nearly erect and cylindrical *B. roteanum* and *B. kuroishicum* var. *littorale*
- 6 { Capsules inclined or horizontal 7
- 7 { Small in size, delicate and soft plant; sporogone also delicate..... 8
- 7 { Plants medium to robust in size 10
- 8 { Leaves deeply plicate *B. procumbens*
- 8 { Leaves concave, not so plicate 9
- 9 { Alar cells small, quadrate and numerous..... *B. hostile*
- 9 { Alar cells more loosely areolated *B. otariense*
- 10 { Leaves clearly serrulate all around 11
- 10 { Leaves entire or obscurely serrulate (but usually clearly
serrulate in upper leaves of branch) 12
- 11 { Dioicous; leaves spread-open when dry, pale yellow *B. wichurae*
- 11 { Autoicous; foliation somewhat divergent or subjulaceous..... *B. salebrosum*
- 12 { Loosely areolated area of leaf base occupies narrowly across the base..... 13
- 12 { The same area occupies widely across the base and consists of much inflated cells .. 14
- 13 { Capsules arcuate, cylindrical *B. buchanani*
- 13 { Capsules arcuate, ovoid-cylindrical *B. glareosum*
- 14 { Autoicous *B. kuroishicum*
- 14 { Dioicous 15
- 15 { Leaves longly acuminate, hair-like pointed, leaf cells very narrow *B. piligerum*
- 15 { Leaves acuminate, but not so long as in above, areolation
looser than in above *B. moriense*

2. *Brachythecium camptothecioides* Takaki sp. nov. (Fig. 9)

Sterile. Planta robustiuscula, caespitosa, caespitibus laxis, intricatis, aureis vel aureo-viridibus, sericeo-nitidis, mollibus. Caulis primarius repens, elongatus usque

Fig. 9.

1- 7. *Brachythecium camptothecioides* Takaki

9-19. *B. pinnatum* Takaki

- 1, 2. Stem leaves ($\times 19$). 3, 4. Branch leaves ($\times 19$). 5. Marginal part of stem leaf ($\times 155$). 6. Median cells of stem leaf ($\times 155$). 7. Basal angle of stem leaf ($\times 134$). 8, 9. Stem leaves ($\times 30$). 10. Branch leaf ($\times 30$). 11. Apical part of stem leaf ($\times 155$). 12. Median cells of stem leaf ($\times 155$). 13. Basal angle of stem leaf ($\times 155$). 14, 15. Perichaetial bracts ($\times 24$). 16. Male plant ($\times 16$). 17. Antheridial head ($\times 48$). 18. Antheridia ($\times 74$). 19. Branch leaf of male plant ($\times 48$).

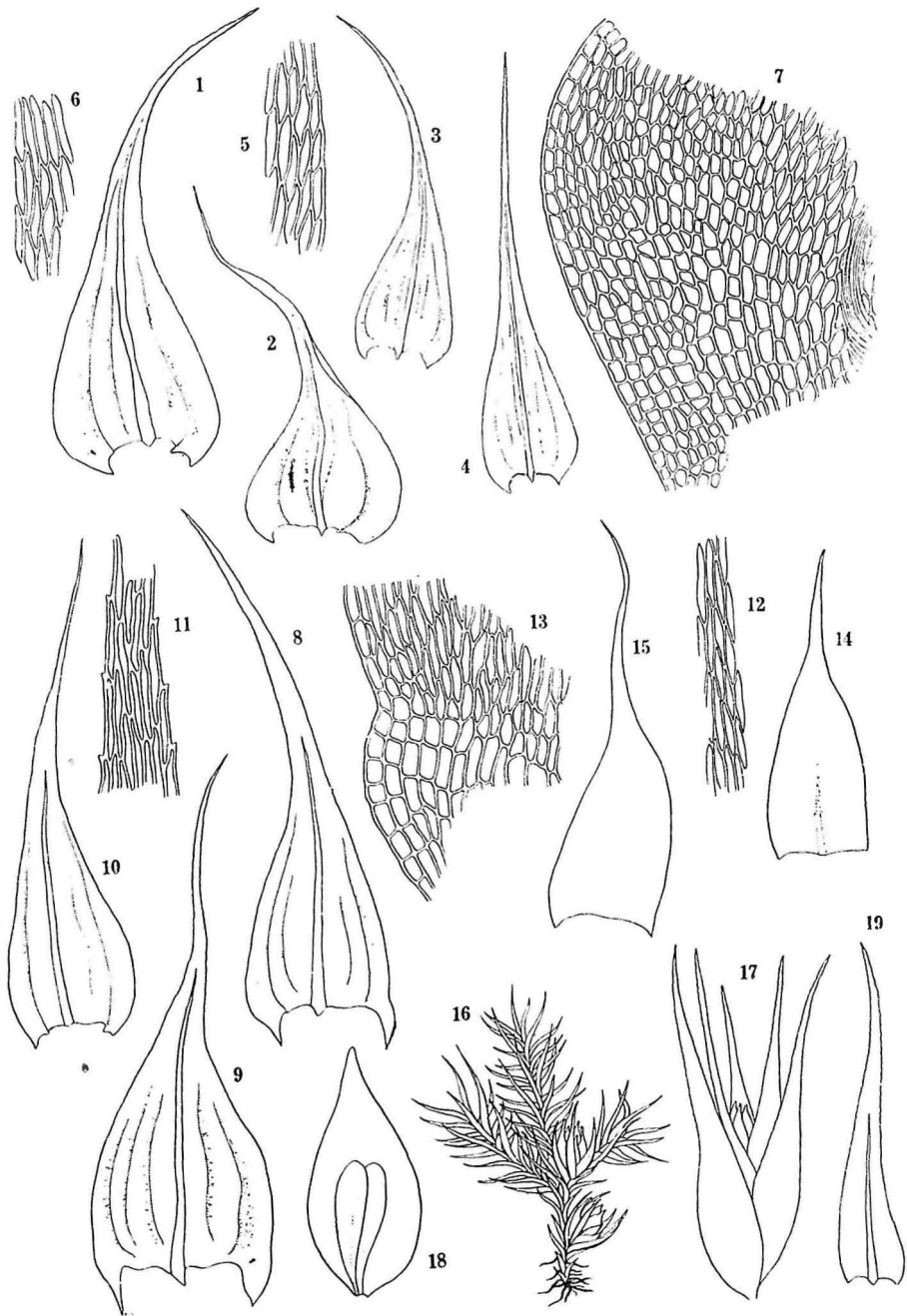


Fig. 9.

4–5 cm longus, hic illic fasciculatim fusco-radiculosus, remote subipinnatim ramosus, ramis erectis vel curvato-erectis, ca. 1–1.5 cm longis, cum foliis ca. 2 mm latis, caudiformiter attenuatis, dense foliosis. Folia sicca adpressa vel erecta, longitudinaliter plicata, humida erecto-patentia. Folia caulina e basi cordato-ovata subsensim subulato-piliforme attenuata, saepe falcata, $2.4\text{--}2.7 \times 1.0\text{--}1.1$ mm, profunde plicata, basi breviter decurrentia, marginibus basi late recurvis, in toto subintegerrimis; nervo valido, infra apicem folii evanido; cellulis laminarum anguste rhomboideis, levibus, $50\text{--}60 \times 6.4 \mu$, sensim basin versus valde laxioribus et rhomboideis, alaribus quadratis vel rectangularibus, numerosis. Folia ramea anguste oblongo-lanceolata, sensim subulato-piliforme attenuata, 2.7×0.7 mm, valde plicata; marginibus in toto minute serrulatis; nervo infra apicem folii evanido. Caetera ignota.

Specim. exam.: **Honshū**. Pref. Nagano: Southern Alps, Miwa-mura (Shiozawa valley) N. Takaki 11616-Holotype, July 19, 1952.

Range: Japan (Honshū).

Hab.: On calcareous rocks in shady place, about 1100 m in altitude.

The deeply and strongly plicate leaves with costa reaching the apex, as is seen in *Pleuropus sciureus*, are the most striking characters of this species. In having looser areolation of leaf-base, it seems to belong to the sect. *Salebrosa*. In forming the golden glossy mats, erect-patent foliation and deeply plicate leaves, this species also resembles *Camptothecium* species, but is easily distinguished from it by the areolation of leaf, especially by that in its basal part.

3. *Brachythecium pinnatum* Takaki sp. nov. (Fig. 9)

Phylloidiocum. Planta mediocris, caespitosa, caespitibus densis, aureo-viridibus, nitidiusculis. Caulis repens, elongatus usque ad 5 cm longus, remote fusco-radiculosus, dense et regulariter ramosus, ramis patulis, ca. 7–12 mm longis, dense foliosis, cum foliis ca. 1 mm latis, simplicibus vel breve ramulosis, caudiformiter attenuatis. Folia sicca paulum adpressa, humida erecto-patentia. Folia caulina longitudinaliter et profunde plicata, basi decurrentia, e basi subcordato-deltoides subito in acumen subulato-piliforme attenuata, 2.4×0.8 mm; marginibus subintegerrimis vel ubique minutissime serrulatis, basi late recurvis; nervo valido, $4/5$ folii evanido; cellulis laminarum anguste rhomboideis, laevibus, $50\text{--}71 \times 6.4 \mu$, sensim basin versus laxioribus, alaribus valde laxis plerumque rectangularibus, hyalinis. Folia ramea e basi cordata sensim longissime lanceolatum attenuata, 2.2×0.6 mm, profunde plicata; marginibus ubique serrulatis; nervo basi crasso, superne tenuiore, ad basin acuminis evanido. Bracteae perichaetii internae e basi lanceolatae, longe piliforme attenuatae,

Fig. 10.

1–6. *Brachythecium helminthocladum* Broth. et Par. (orig. specim.)

7–11. *B. roteanum* De Not. (*Faurie* 71)

12–18. *B. kuroishicum* var. *littorale* Card. (orig. specim.)

1, 2. Stem leaves ($\times 19$). 3. Branch leaf ($\times 19$). 4. Marginal part of stem leaf ($\times 155$). 5. Median cells of stem leaf ($\times 155$). 6. Basal angle of stem leaf ($\times 155$). 7. Stem leaf ($\times 19$). 8. Median cells of stem leaf ($\times 155$). 9. Basal angle of stem leaf ($\times 155$). 10, 11. Capsules ($\times 12$). 12, 13, 14. Stem leaves ($\times 19$). 15. Branch leaf ($\times 19$). 16. Median cells of stem leaf ($\times 155$). 17. Basal angle of stem leaf ($\times 155$). 18. Capsule ($\times 12$).

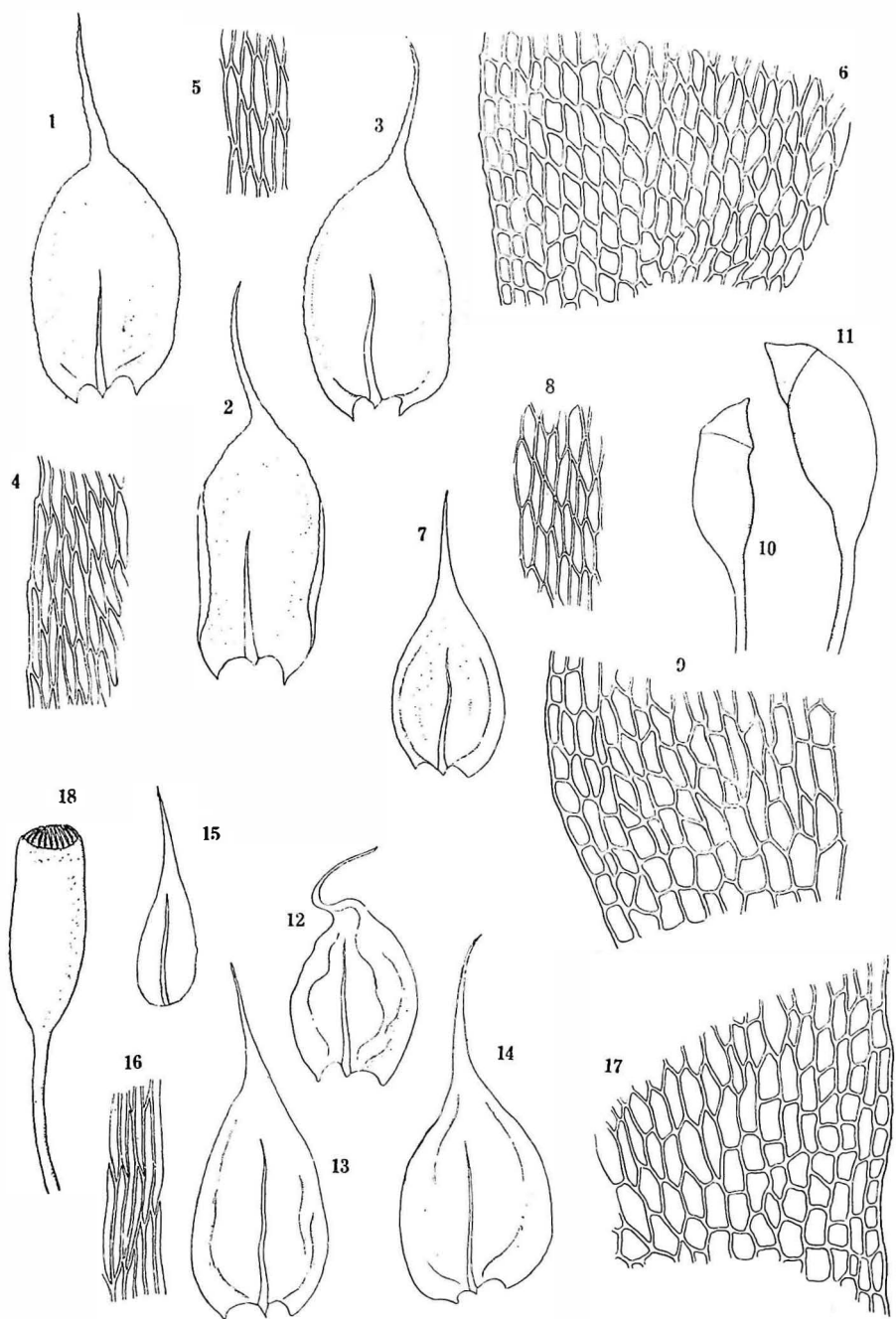


Fig. 10.

ca. 2.2×0.6 mm; marginibus integris; nervis indistinctis. Seta ca. 1 cm longa, laevis. Caetera desideratur.

Specim. exam.: **Honshū**. Pref. Nagano: Southern Alps, Miwa-mura (Shiozawa valley) N. Takaki 11626-Holotype, July 19, 1952.

Range: Japan (Honshū).

Hab.: On calcareous rocks in shady places, about 1100 m in altitude.

The male plant of this species is very diminutive, growing among the tufts of female plants, attaining ca. 2.6 mm in height, with 1-2 branches, leaves very narrowly lanceolate, ca. 1×0.2 mm, margins serrate all around, costa $2/3$ length of leaf, inner perigonal bracts ovate, shortly and obtusely acuminate, 0.45×0.2 mm. This species closely resembles *B. camptothecioides* in having deeply plicate and longly acuminate leaves with longer costa. But the former has, besides that shown in the key, more longly pointed leaf-acumen and costa not reaching the acumen.

4. *Brachythecium helminthocladum* Broth. et Par. (Fig.10)

Brachythecium helminthocladum Broth. et Par. in Rev. Bryol. **31**: 63 (1904); Broth. in Engler, Pfl.-fam. **11**: 362 (1925); Reimers & Sakurai in Bot. Jahrb. **44**: 551 (1931); Sakurai; Musc. Jap. 135, Pl. 54-d (1954).

Brachythecium luxitertum Broth. in Över. Finsk. Vet.-Soc. Förh. **62**: 52 (1919-1920); Sakurai, l.c. 136 (1954). Syn. nov.

Brachythecium Tsunodae Broth. l.c. 51 (1919-1920); Yasuda in Bot. Mag. Tokyo, **29**: 155 (1915). Syn. nov.

Brachythecium kuroishicum Besch. var. *helminthocladon* (Broth. et Par.) Card.; Dixon in Rev. Bryol. **4**: 158 (1931).

Homalothecium perpiliferum Sakurai in Bot. Mag. Tokyo, **50**: 371, f. 12 (1936). Syn. nov.

Cirriphyllum laxibasilare Dix. in sched.

Cirriphyllum piliferum (non Grout) Sakurai, l.c. **50**: 266 (1936). Syn. nov.

Musci Japonici Exsiccati ser. 7, n. 304 (1935).

In dense tufts, bright green, rather glossy. Stems very stout 5-10 cm long, creeping, irregularly divided, sending up julaceous, densely foliate branches. Branches robust, tumid or somewhat cylindrical, straight or somewhat curved, gradually attenuate, subobtuse, often flagelliform. Leaves broadly ovate-lanceolate, slightly decurrent, round at apex and suddenly contracted into a very long hair-like point, slightly denticulate all around, very concave. Costa stout at base, rapidly weakens upwards, scarcely reaching the middle, median leaf-cells linear-oblong or narrowly rhomboidal, $64 \times 10 \mu$, gradually becoming shorter and wider towards the base and forming a wide basal area consisting of large, rhomboidal and loosely areolated cells, extreme alar cells subquadrate. Seta 1.5-2 cm, smooth. Capsules

Fig. 11.

1-10. *Brachythecium nakajimae* Ihsiba (orig. specim.)

11-18. *B. campestre* Bryol. Eur. (*Faurie* 830)

1, 2. Stem leaves ($\times 19$). 3, 4. Branch leaves ($\times 19$). 5. Median cells of stem leaf ($\times 155$). 6. Median cells of branch leaf ($\times 155$). 7. Basal angle of stem leaf ($\times 155$). 8. Basal angle of branch leaf ($\times 155$). 9, 10. Capsules ($\times 9$). 11, 13. Branch leaves ($\times 24$). 12, 14. Stem leaves ($\times 24$). 15. Median cells of stem leaf ($\times 155$). 16. Basal angle of stem leaf ($\times 155$). 17, 18. Capsules ($\times 12$).

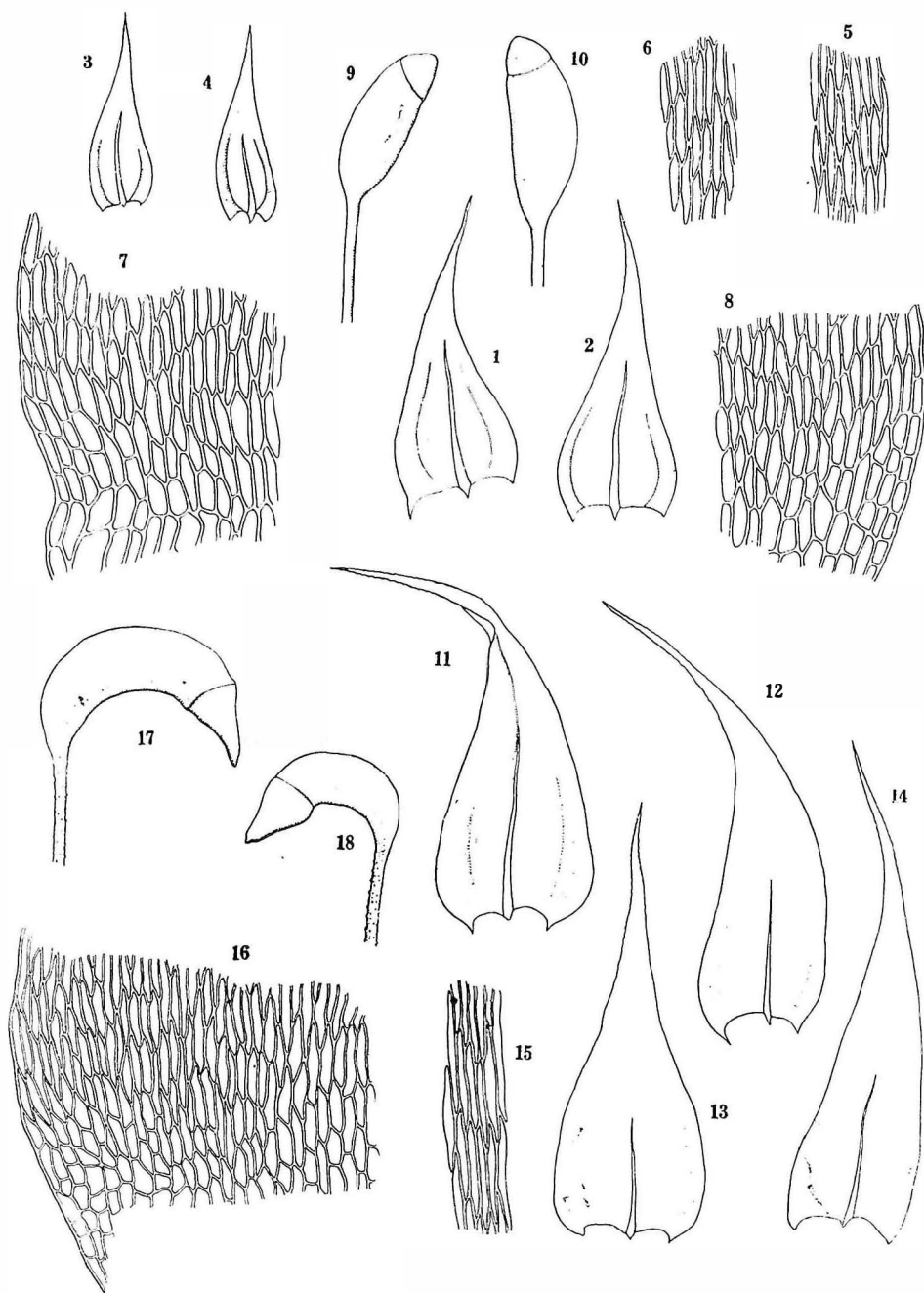


Fig. 11.

dark brown, oblong-ovoid, 2.5×1 mm, usually arcuate and inclined, often nearly subsymmetrical. Peristome normal.

Specim. exam.: **Honshū**. Pref. Aomori: Minamitsugaru-gun *Mizs.* 4849, Osoreyama *Nog.* 21221. Pref. Iwate: Mt. Hayachine *Uematsu* 80 (orig. specim. of *B. laxitextum*). Pref. Yamagata: Nishitagawa-gun *Nog.* 16318. Pref. Gumma: Mt. Komochi *K. Tsunoda* (orig. specim. of *B. Tsunodae*). Pref. Saitama: Chichibu *Mizs.* 98. Pref. Tokyo: Mt. Kariyose *Tak.* 1549, 2219. Pref. Niigata: Higashikambara-gun *Ikeg.* 3141, Nakakambara-gun *Ikeg.* 8951, Nishikambara-gun *Ikeg.* 8292, Kariwa-gun *Ikeg.* 51, Niigata-shi *Ikeg.* 8773, Is. Sado *Ikeg.* 12381, Mase *Nog.* 21986. Pref. Nagano: Mt. Ontake 1200 m *Tak.* 14087. Pref. Aichi: Miwamura *Tak.*, Mt. Mikuni *Tak.* 13640, Yushima *Tak.* 7814, 7819. Pref. Shiga: Mt. Ibuki *Nog.* 28717, Nishiōji-mura *Nog.* 15764. Pref. Mie: Akame *Mag.* 901, Ōsugidani *Mag.* 2544. Pref. Kyoto: Kibune *Toy.* 672. Pref. Ōsaka: Nishinose *Nak.* 3681, Shimamoto-machi *Mizt.* 2594, Mt. Myōken *Nak.* 5501. Pref. Hyōgo: Mt. Rokkō *Mag.* 291, Mt. Minoo *Ikeg.* 7670, Mt. Katsuoji *Ikeg.* 7455. Pref. Tottori: Yazu-gun *H.O.* 893, Mt. Mitoku *Inoue* 6237, Mt. Hanami *Nog.* 2864. Pref. Shimane: Gakuenji *Nog.* 30113. Pref. Okayama: Atetsu-gun *Igi* 2561. Pref. Hiroshima: Okinoshima *Nog.* 26822, Hiroshima-shi *H.O.* 503. **Shikoku**. Pref. Ehime: Niigun *Nog.* 23785, 23786, 23787, Uma-gun *K.O.* 6465, Saijō-shi *K.O.* 3914, Mt. Ishizuchi *K.O.* 2673. Pref. Kōchi: Hongawa-mura *Nog.* 14086. **Kyūshū**. Pref. Nagasaki: Nagasaki *U.F.* 1589 (orig. specim. of *B. helminthocladum*). Pref. Kumamoto: Kōnose *Nog.* 25886, Hitoyoshi *Nog.* 27105, Musc. Jap. Exsiccati no. 303, Kumamoto-shi *Nog.* 21647, Mt. Fukaba *Toy.* 461, *Tak.* 108, 2539, 2881, 2560, 2576, Yamanishi *Tak.* 1576, Kakizako *Tak.* 2198, Mt. Shakain *Tak.* 2334, 2336, Yoshio-mura *Tak.* 2994, Gokanoshō *Sugino* 1, Mizukami-mura *Mayeb.* 958, Yamae-mura *Mayeb.* 1183, Watari-mura *Mayeb.* 1372. Pref. Ōita: Mt. Kujū *Nog.* 4367, *Tak.* (orig. specim. of *Homalothecium perpiliferum*), Mt. Takazaki *Nog.* 20071, Fukayabakei *Nog.* 18969, 18970, 18980, Ootobaru *Nog.* 14041, 14042, Yufuin-mura *Nog.* 16637, Mt. Yufu *Nog.* 14314.

Range: Japan (Honshū, Shikoku and Kyūshū).

This species is readily distinguishable by the terete branches, leaf form as seen in the genus *Cirriphyllum* and characteristic areolation of leaf base as shown in Fig. 10. Among these characters, the leaf form is fairly variable, so we often come across leaves which are not quite typical in form. Even in such a case, we can recognize this species by the feature of areolation of leaf base. This species is distributed in the areas mentioned above. It occurs more abundantly in the southern part of Japan, and makes a contrast with *B. kuroishicum* which is distributed mainly in northern Japan. It is interesting to find intermediate forms of both species in northern Honshū where both species are found mixed together. An examination of the original specimens of *Brachythecium laxitextum*, *B. tsunodae* and *Homalothecium perpiliferum* has revealed that they are all conspecific with *B. helminthocladum*.

5. *Brachythecium nakajimae* Ihsiba (Fig. 11)

Brachythecium nakajimae Ihsiba in Trans. Sapporo Nat. Hist. Soc. 4: 394 (1934).

Plants delicate, dirty green, closely applied to the substratum, forming dense and low (5–7 mm high) tufts. Stems creeping, irregularly divided, radiculose at base. Branches numerous, ascending, flexuose, attenuate at apex, subjulaceous, 3–5 mm long. Stem leaves broadly ovate-lanceolate to triangular-ovate, slenderly long-acuminate, 2.5×8.7 mm, decurrent, margins nearly entire or slightly denticulate above, costa extending beyond the middle; median leaf-cells linear-fusiform, $64 \times 6.4 \mu$, gradually becoming wider towards base, basal cells pellucid, alar cells somewhat

quadrate. Branch leaves similar to the stem leaves in form and areolation. Seta 6–8 mm, smooth. Capsules oblong-ovoid, inclined, ca. 2.2×1.0 mm. Operculum convex-conic, not rostrate. Dioicous.

Specim. exam.: **Honshū**. Pref. Tōkyō: Ōtsuka *T. Nakajima 113* (orig. specim.). Pref. Aichi: Mt. Hōrai *Tak. 16283*.

Range: Japan (Honshū).

Hab.: On moist bricks or rocks.

This species closely resembles small forms of *B. buchanani*, except the operculum which is convex and not at all rostrate, and small sporogone with short seta. But these distinguishing points may possibly be regarded as variation within *B. buchanani*. So far as the author's collections, which are not ample, of this species go, he is led to recognize it, for the present, as a separate species, on the base of the characters mentioned above.

6. *Brachythecium campestre* Bryol. Eur. (Fig. 11)

Brachythecium campestre Bryol. Eur. fasc. 52–54, pl. 545 (1853); Broth. in Engler, Pfl.-fam. 11: 362 (1925).

Hypnum rutabulum campestre C. Muell. Syn. 2: 368 (1851).

Brachythecium subalbicans De Not. Cronaca 2: 20 (1867).

Plants in wide and lax masses, prostrate, bright green or yellowish green. Stems irregularly branched, creeping. Branches 1–2 cm long, erect or ascendent, complanately foliate, attenuate at the ends. Branch leaves rather distant, erect-patent, often somewhat falcate-secund, ovate-lanceolate, gradually narrowing to a long acumen, somewhat decurrent, slightly concave, plicate, entire or slightly serrulate below, denticulate above; costa thin, extending $1/3$ – $2/3$ length of leaf; median leaf-cells fusiform-hexagonal, 85 – 100×6.5 – 8μ , basal and alar cells broader and shorter, extreme alar cells subquadrate. Seta 2.5–3 cm long, reddish brown, more or less roughened with rather low distant papillae, nearly smooth below. Capsules reddish brown, oblong-ovoid, usually strongly arcuate, inclined. Operculum longly conic, apiculate. Autoicous.

Specim. exam.: **Honshū**. Pref. Aomori: Aomori *U.F. 830*, Kamikita-gun *Miss. 6027*.

Range: Europe, Caucasus, Kashmir, Siberia, North America and Japan (northern Honshū).

This is a new addition to the flora of Japan. Resembling *B. plumosum* in habit, but differing in the leaves, which have looser areolation at base and alar parts. Above description has been drawn up on the Japanese materials. Very rare in Japan.

7. *Brachythecium roteanum* De. Not. (Fig. 10)

Brachythecium roteanum De Not. in Cronaca 2: 19 (1867).

Brachythecium salebrosum var. *cylindricum* Bryol. Eur. fasc. 52–54, pl. 550 (1853); Bescherelle in Ann. Sc. Nat. ser. 7, 17: 373 (1893).

Brachythecium salebrosum texanum Aust. in Bull. Torr. Club. 6: 44 (1875).

Plants in golden or yellowish green, glossy mats. Stems creeping, sending up erect slender branches. Branches densely crowded, terete when dry, 10–15 mm long. Stem leaves broadly ovate-lanceolate, 2.3 – 2.6×0.9 – 1.0 mm, longly acuminate, serrate above, concave, deeply plicate; costa stout at base, rapidly narrowing in the lower portion, extending beyond the middle; areolation usually looser, median

leaf-cells fusiform-hexagonal (4:1) or linear-fusiform (6-8:1), basal and alar cells much larger and pellucid, oblong-rhomboidal to quadrate. Seta 1.0-1.5 mm, reddish brown, smooth. Capsules reddish brown or dark-brown, cylindric, nearly erect, slightly arcuate, $2.2 \times 0.9-1.0$ mm. Autoicous.

Specim. exam.: **Hokkaidō**. Is. Rishiri: Yamunai valley *Hatt.* 22015, 21995, 22017. Is. Rebun: *Iwaz. Tak.* 15037, 15044, 15075, 15043, 15084, 15047, 15076, 15077, 15085, 15050, 15058, 15074, 15081, 15057, *Hatt.* 21697, Kabuka *Hatt.* 21614, 21618. Prov. Kamikawa: Mt. Daisetsu *Nog.* 27613. Prov. Shiribeshi: Otaru *U.F.* 71 (det. Bescherelle as *Brachythecium salebrosum* var. *cylindricum*). **Honshū**. Pref. Toyama: Kurobe valley *Tak.* 14713.

Range: Europe, North America and Japan (Hokkaidō and northern half of Honshū).

The report on the occurrence of this species in Japan was made by Bescherelle based on Faurie's specimen gathered in Otaru (Hokkaidō). The above diagnosis is drawn from this very specimen. It well agrees with the European and North American specimens in many respects, except that our specimens have median leaf-cells shorter and loosely areolated.

8. *Brachythecium procumbens* (Mitt.) Jaeg. (Fig. 12)

Brachythecium procumbens (Mitt.) Jaeg. in *Adumbr.* 2: 409 (1876-77); Broth. in Engler, *Pfl.-fam.* 11: 360 (1925); Reimers & Sakurai in *Bot. Jahrb.* 64: 551 (1931); Sakurai in *Bot. Mag. Tokyo*, 48: 392 (1934); *Musc. Jap. pl.* 54-r (1954).

Hypnum (*Brachythecium*) *procumbens* Mitt. in *Journ. Proc. Linn. Soc.* 1: 79 (1859).

The type locality of this species is India. The author has not seen the original specimen, but, had fortunately a chance to examine an Indian specimen preserved at the Herbarium of Tokyo Science Museum. This specimen which is sterile, agrees with the original description, and we find also that this is allied to *B. buchanani* var. *gracillimum*. Both are dioicous and have stems slenderly creeping, subpinnately branching, forming soft intricate procumbent mats; branches short; leaves ovate-lanceolate, gradually tapering into a long acumen, margins entire (minutely serrulate all around in branch leaves), costa $3/4$ or more length of leaf, median leaf-cells linear-fusiform, etc. But, the author has found these two are scarcely distinguishable by the following points. *B. procumbens* has deep and plentiful plication in the leaf and a more longer costa. In the other species, plication is not so deep and not so plentiful as in the former and costa is shorter. Moreover, in the Indian material of *procumbens*, it has terete-foliation both in dry and moist conditions. Contrary to it, our material has divergent foliation in moist state. The author is unable to assert whether this character is stable or not, owing to the scantiness of Indian materials in the author's herbarium.

This species was reported by Sakurai and Reimers from Korea, and by Sakurai from Is. Sakurajima (southern Kyūshū). The author has had no opportunity of examining either of these specimens as yet.

Specim. exam.: **Honshū**. Pref. Saitama: Mt. Shiroishi *Mizs.* 3627. **Kyūshū**. Pref. Kumamoto: Kōnose-mura *Mayeb.* 1402, 1346.

Range: Kashmir, Nepal, Korea and Japan (Honshū and Kyūshū).

Hab.: On calcareous rocks.

9. *Brachythecium hastile* Broth. et Par. (Fig. 13)

Brachythecium hastile Broth. et Par. in *Rev. Bryol.* 31: 62 (1904); Broth. l.c. 361 (1925); Sakurai, l.c. 135 (1954).

Plants glossy yellow-green, forming complanately and loosely intricate mats. Stems creeping, 4–5 cm, clinging closely to the substratum, primary stems simple or sparsely dividing, pinnately and complanately branching. Branches soft, short 2–3 mm long, attenuate at the ends, subulaceous. Stem leaves broadly ovate-lanceolate, rather abruptly acuminate, $1-1.4 \times 0.4-0.5$ mm, slightly decurrent, less concave, minutely serrulate all around; costa extending beyond the middle, varying in width throughout the whole length and indistinctly bordering with the lamina; median leaf-cells linear-vermicular, $41-46 \times 5.7-6.7 \mu$, areolation gradually becoming looser towards base, basal cells oblong-hexagonal, alar cells much shorter, quadrate, numerous. Perichaetium reaching a length of 2 mm, sheathing at base with spreading points, distantly serrate above; costa nearly obsolete. Seta 1–1.3 cm, smooth, reddish brown. Capsules oblong-ovoid, $1-1.3 \times 0.5-0.7$ mm, asymmetric, inclined or horizontal. Peristome normal, but cilia short.

Specim. exam.: **Honshū**. Pref. Aomori: Kanita *U.F.* (orig. specim.).

Range: Japan (northern Honshū).

No opportunity for re-examination of this species has been afforded, for its original specimen is not found among Faurie's collections preserved in Kyoto University. The author, however, was enabled to examine the type specimen by the courtesy of University of Helsinki. The above description and figure are based on this specimen. This species is allied to *B. otaruense* in many respects, but differs from it in the characters shown in the key, as well as in costa in that it is stout, it varies in width along the length and it is inconspicuous in its outline.

10. *Brachythecium otaruense* Card. (Fig. 13)

Brachythecium otaruense Card. in Bull. Soc. Bot. Gen. ser. 2, 3: no. 7 (1911); Broth. l.c. 361 (1925); Sakurai, l.c. 135 (1954).

Plants in wide, dense, much intricate, glossy yellowish green mats. Stems creeping, radiculose, closely applied to the substratum, irregularly branching, sending up densely foliate julaceous branches. Branches ascending, 5–15 mm long, unequal, attenuate towards ends. Stem leaves ovate-lanceolate, slenderly longly acuminate, ca. 1.8×0.57 mm, apex often slightly twisted, decurrent, very concave, entire; median leaf-cells linear-fusiform, $98-100 \times 8-9.6 \mu$, basal and alar cells large, hyaline, thin-walled, quadrate, forming very distinct pellucid area across the base; costa thin, extending $2/3-3/4$ length of leaf. Branch leaves closely imbricate, broadly ovate lanceolate, gradually acuminate, very concave, entire, areolation as in stem leaves; costa extending beyond the middle, stout at base, rapidly narrowing in the lower portion. Perichaetium 2.3 mm long with spreading points, sheathing at base, inner leaves long-filiform acuminate from an oblong base, nearly entire, very loosely areolate, thinly costate. Seta short, ca. 7 mm long, smooth, dark reddish brown, sinking in the mats. Capsules reddish brown, oblong-ovoid, small, 1.3×0.65 mm. Operculum conic-apiculate, 0.52 mm long. Calyptra smooth. Dioicous?

Specim. exam.: **Hokkaidō**. Is. Rebun: Kabuka *Hatt.* 21648, *Iwaz. Tak.* 15061. Prov. Kushiro: Teshikaga *Ando* 2758, Mt. Oakan *Ando*. Prov. Ishikari: Mt. Moiwa *Nog.* 15622, Jōzankei *Nog.* 28055. Prov. Shiribeshi: Otaru *U.F.* 3758 (orig. specim.). **Honshū**. Pref. Akita: Mt. Komagatake *Mizs.* 4869. Pref. Yamagata: Yamadera-mura *Tak.* 16282. Pref. Niigata: Minamiuonuma-gun *Ikeg.* 18213, Nakauonuma-gun *Ikeg.* 7962. Pref. Mie: Mt. Ōdai-

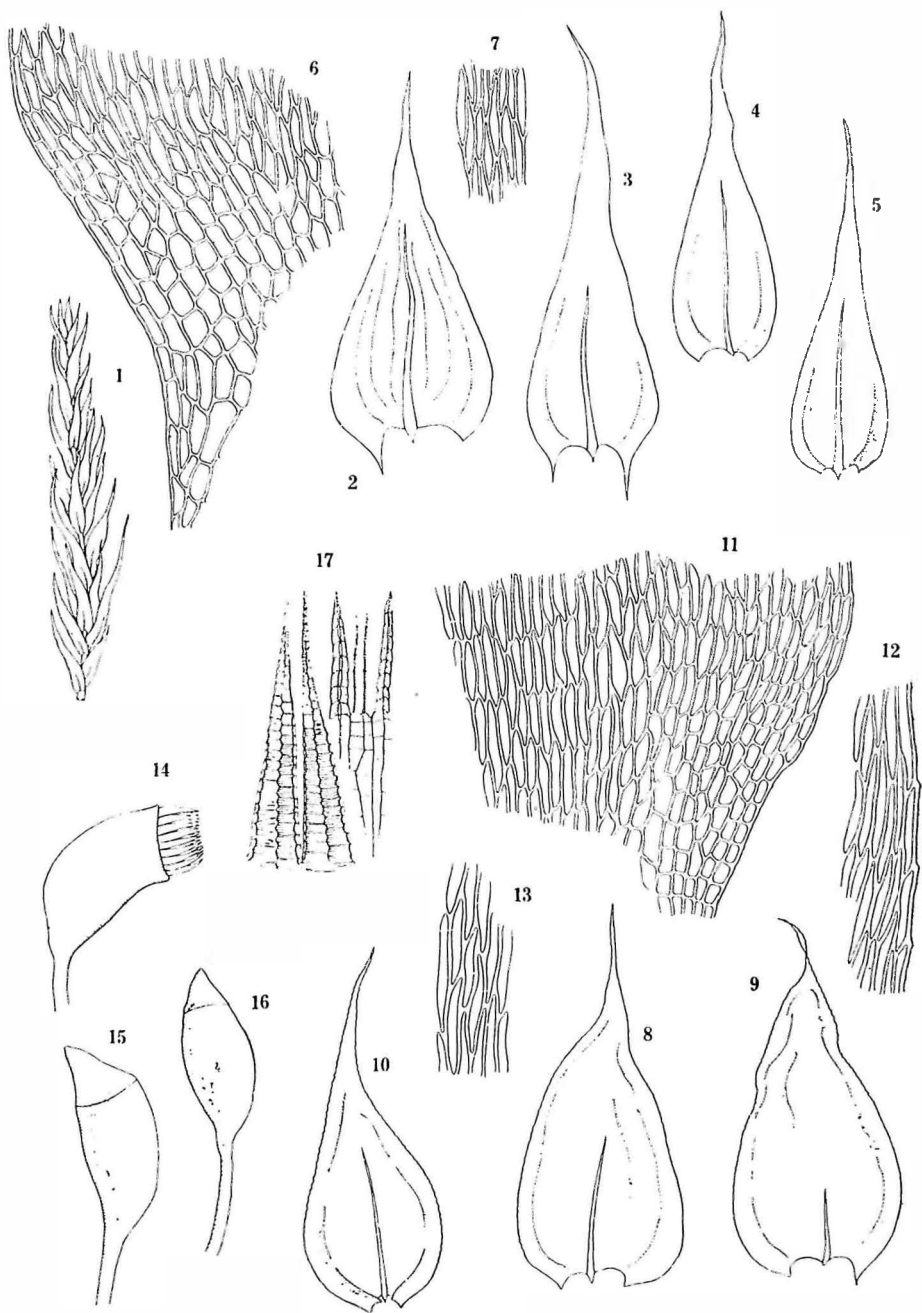


Fig. 12.

gahara *Tak.* 4984, Mt. Shimaji *Mag.* 2318.

Range: Japan (Hokkaidō and Honshū).

It resembles *B. buchanani*, but differs in more flexuose stems, more loosely areolate leaf-base and small sporogone (in the original specimen it is sinking in the tufts).

11. *Brachythecium wichurae* (Broth.) Par. (Fig. 12)

Brachythecium wichurae (Broth.) Par. in Bull. Herb. Bois. ser. 2, 2: 931 (1902); Index 1: 164 (1904); Dixon in Rev. Bryol. 4: 158 (1931); Broth. in Engler, Pfl.-fam. 11: 362 (1925); Reimers & Sakurai in Bot. Jahrb. 64: 551 (1931); Sakurai, Musc. Jap. 136 (1954).

Hypnum (Brachythecium) Wichurae Broth. in Hedwigia 38: 239 (1899).

Brachythecium Wichurae Broth. var. *robusta* Broth. in Mazzet., Symb. Sinic. 4: Musci: 106 (1929); Dixon l.c. 158 (1931); Sakurai, l.c. 136 (1954). Syn. nov.

Brachythecium kiusianum Sakurai in Bot. Mag. Tokyo, 46: 381 (1932); Musc. Jap. 136 (1954). Syn. nov.

Musci Japonici Exsiccati ser. 2, no. 92 (1948).

Plants in soft, pale bright green to yellowish white tufts. Stems decumbent or ascending and radiculose, often stoloniferous at the ends, irregularly divided, sending up numerous branches. Branches somewhat spreading and divergent foliate when dry. Leaves broadly ovate-lanceolate or triangular-ovate, 1.0–1.2 × 2.2–3.0 mm, slenderly long-acuminate, slightly decurrent, very concave, more or less plicate, often twisted at point, serrulate all around, often more sharply serrate above. Median leaf-cells oblong-hexagonal, 0.10–0.12 mm long, 6–8 times as long as broad, basal and alar cells conspicuously broader and shorter, rhomboid-quadrate; costa thin, scarcely reaching the middle, rarely very short. Seta up to about 3 cm in length, smooth. Capsules oblong-ovoid, arcuate, horizontal or inclined, 2.2 × 1.0 mm. Dioicous.

Specim. exam.: **Honshū.** Pref. Gumma: Ōshimizu *Mizs.* 1318. Pref. Chiba: Mobara *Asano* 77. Pref. Aichi: Funatsuki-mura *Tak.* 5711. Pref. Mie: Mt. Tado *Mag.* 2634, Ujiiyama *Mag.* 55, Mt. Asama *Mag.* 5, Watari *Mag.* 245. Pref. Nara: Mt. Tōnomine *Mizt.* 1795. Pref. Ōsaka: Kishiwada *Nak.* 3930, Mt. Inunaki *Nak.* 3953, Kaizuka-shi *Nak.* 4263. Pref. Kyōto: Ōe-machi *Nak.* 4069. Pref. Wakayama: Arita-gun *Nog.* 9109. Pref. Hiroshima: Sandankyō *Nog.* 8931. **Shikoku.** Pref. Ehime: Saijō-shi *Nog.* 30807, K.O. 460, Shūsō-gun *Mizs.* 6784. Pref. Kōchi: Sodayama *Nog.* 15760, Ochi-machi *Nog.* 15736. **Kyūshū.** Pref. Nagasaki *leg. Wichura* (orig. specim.). Pref. Fukuoka: Mt. Hōman *Nog.* 8125. Pref. Kumamoto: Kamio-mura *Tak.* 4435, 4436, Mt. Arao *Tak.* 2771, 2786, Mt. Sannotake *Tak.* 2762, Mt. Konoha *Tak.* 22, Mt. Shakain *Tak.* 2343, Kugino-mura *Tak.* 2919, Tanoura-mura *Tak.* 2918, 3384, Nishikino-mura *Tak.* 207, Kōnose-mura *Nog.* 3497, Aida-mura *Mayeb.* 386, Hitoyoshi

Fig. 12.

1–7. *Brachythecium procumbens* (Mitt.) Jaeg. (Indian specimen)

8–17. *B. wichurae* (Broth.) Par. (orig. specim.)

1. Portion of branch (×12). 2, 3. Stem leaves (×24). 4, 5. Branch leaves (×35). 6. Basal angle of stem leaf (×155). 7. Median cells of stem leaf (×155). 8, 9. Stem leaves (×19). 10. Branch leaf (×19). 11. Basal angle of stem leaf (×93). 12. Marginal part of stem leaf (×155). 13. Median cells of stem leaf (×155). 14, 15, 16. Capsules (×12). 17. Peristome teeth (×60).

Nog. 25813, Isshōchi *Mayeb.* 822, Ichibu *Mayeb.* 191, Nishize *Sas.* 4632 (det. Dixon as *B. wichurae* var. *robustum*). Pref. Ōita: Mt. Jinkakuji *Nog.* 19227. Pref. Kagoshima: Uchinoura *Sak.* 2125 (orig. specim. of *B. kiusianum*), Yokogawa *Nog.* 26352, Is. Tanegashima *Nog.* 26358, Mt. Kimpu *Nog.* 21816. Pref. Miyazaki: Yasuhisa *Nog.* 4398, Mt. Futakami *Nog.* 16613, Nakanogō-mura *Sas.* (det. Dixon as *B. wichurae* var. *robustum*), Nichinan (Musc. Jap. Exsiccata no. 92).

Range: Japan (southern half of Honshū, Shikoku, Kyūshū) and Yun-nan.

This is closely allied to *B. salebrosum* and *B. coreanum* in many respects, and the difference will be discussed later. *B. wichurae* var. *robustum* described by Brotherus, was based on the specimen from Yun-nan. It was also reported from Japan by Dixon. He states that the Japanese specimen agrees well with the type specimen from Yun-nan. The author has examined the Japanese specimen dealt with by Dixon, and came to the conclusion that it is quite impossible to find any distinction between this and the type specimen of *B. wichurae*. *B. wichurae* is very variable in size, so the var. *robustum* is supposed to be an unnecessary taxon, though the author has had no chance of examining the type specimen of this variety.

12. *Brachythecium salebrosum* (Hoffm.) Bryol. Eur.

Brachythecium salebrosum (Hoffm.) Bryol. Eur. fasc. 52-54, pl. 549 (1853); Beschereille in Ann. Sci. Nat. ser. 7, 17: 373 (1893); Broth. in Hedwigia 38: 238 (1899); Paris in Bull. Herb. Bois. ser. 2, 2: 931 (1902); Broth. in Engler, Pfl.-fam. 11: 362 (1925); Reimers & Sakurai in Bot. Jahrb. 64: 551 (1931); Sakurai, Musc. Jap. 136, pl. 54-f (1954).

Hypnum salebrosum Hoffm. in Deutschl. Fl. 2: 74 (1795); Lindberg in Act. Soc. Fenn. 10: 251, 274 (1872).

Hypnum plumosum salebrosum C. Muell., Syn. 2: 359 (1851).

Brachythecium laevisetum Kdb. in Bull. Torr. Bot. Club. 17: 279 (1890).

In having robust habit, longly plicate leaves with loose, pellucid basal areolation and conspicuous serration, this species is an akin to *B. wichurae*, and both are often confused with each other. The both are distinguished in the following points.

B. wichurae

1. Dioicous.
2. Plants usually soft, pale or whitish green.
3. Stems usually more flexuose.
4. Foliation irregularly spreading, often somewhat squarrose when dry.
5. Leaves widely ovate-lanceolate.
6. Operculum conical, less rostrate.

B. salebrosum

1. Autoicous.
2. Plants somewhat rigid, usually dirty green or yellowish green.
3. Stems less flexuose.
4. Foliation more or less imbricate or slightly appressed.
5. Leaves lanceolate or ovate-lanceolate with longer acumen.
6. Operculum conspicuously rostrate.

Fig. 13.

1-6. *Brachythecium otaruense* Card. (orig. specim.)

7-19. *B. hostile* Broth. et Par. (orig. specim.)

1, 2. Stem leaves ($\times 35$). 3. Branch leaf ($\times 35$). 4. Median cells of stem leaf ($\times 155$). 5. Basal angle of stem leaf ($\times 155$). 6. Capsule ($\times 12$). 7. Plant ($\times 1$). 8, 9. Stem leaves ($\times 35$). 10, 11. Branch leaves ($\times 35$). 12. Median cells of stem leaf ($\times 155$). 13. Ditto ($\times 218$). 14. Marginal part of stem leaf ($\times 218$). 15. Basal angle of stem leaf ($\times 155$). 16, 17. Perichaetial bracts ($\times 35$). 18, 19. Capsules ($\times 16$).

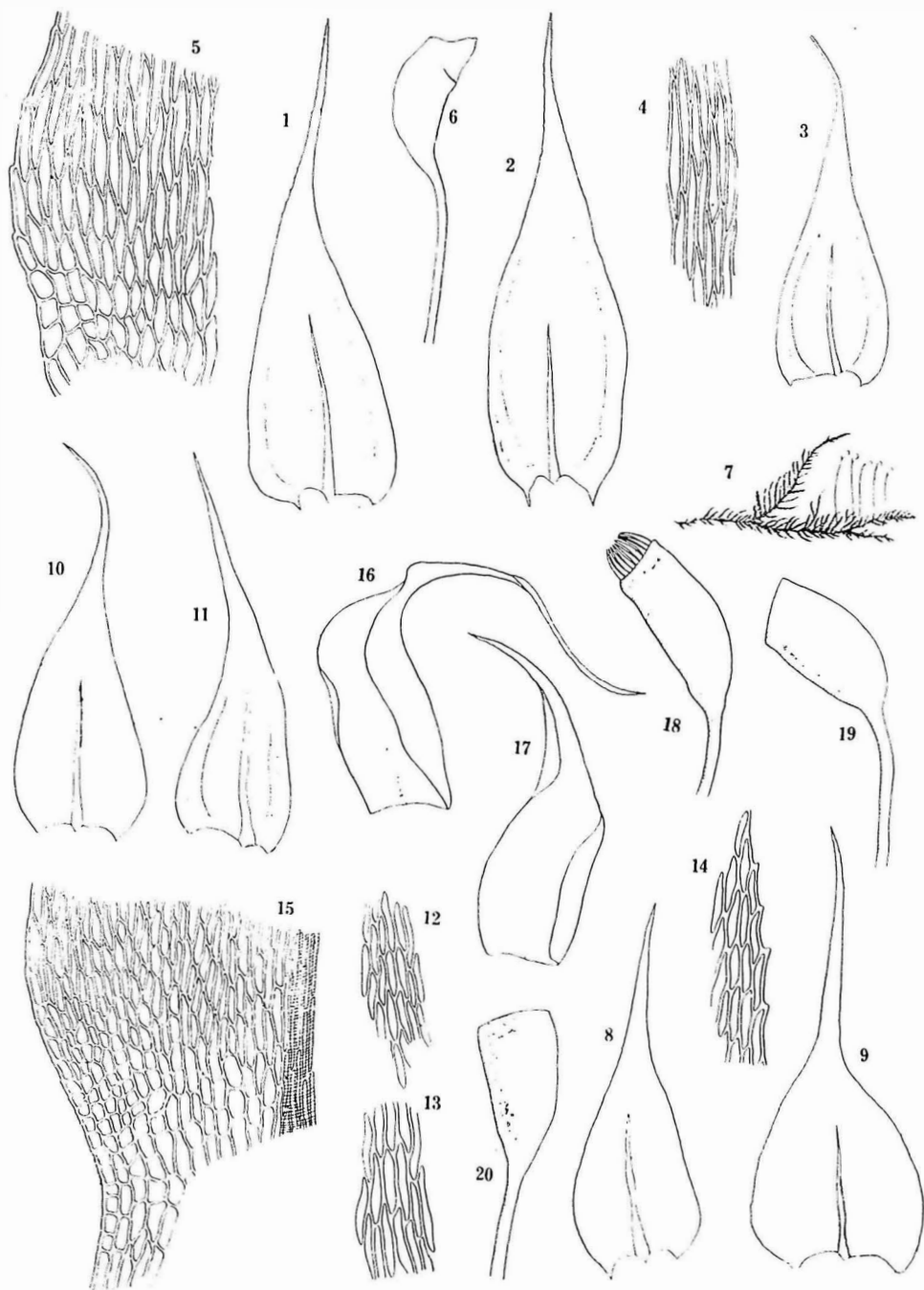


Fig. 13.

This is usually considered to be a common species in Japan, but the author has not met with the typical *salebrosum* quite frequently from the present areas.

Specim. exam.: **Honshū**. Pref. Akita: Takasu-machi *Nog.* 26617. Pref. Yamagata: Itaya *U.F.* 2754. Pref. Tokyo: Tokyo *Sak.* Pref. Hyōgo: Mt. Futatabi *Tat.* 7386.

Range: Europe, Is. Azores, Is. Canary, Morocco, Algiers, North America, Is. Tasmania, Is. Kerguelen, Asia and Japan.

The var. *rostratum*³ was described under this species by Besch. based on Faurie's collection gathered in Aomori (northern Honshū). The author has been unable to find its original specimen in Faurie's collections preserved in Kyoto University. Discussion on this variety is expected in future investigation.

13. *Brachythecium buchanani* (Hook.) Jaeg. (Fig. 14)

Brachythecium buchanani (Hook.) Jaeg. in *Adumbr.* 2: 407 (1876-77); Broth., l.c. 360, f. 687 (1925); Reimers & Sakurai, l.c. 551 (1931); Bartram in *Philip. Jour. Sci.* 61: 298, pl. 22, f. 379 (1939); Sakurai, l.c. 135 (1954).

Hypnum Buchanani Hook. in *Trans. Linn. Soc.* 9: 320 (1808); Broth. in *Hedwigia* 38: 239 (1899).

Brachythecium Buchanani (Hook.) Jaeg. var. *japonicum* Card. in *Bull. Soc. Bot. Gen.* ser. 2, 3: no. 7 (1911); Sakurai, l.c. 135, pl. 54-a (1954). Syn. nov.

Plants in wide, loose, dark green to yellowish green often dirty green mats, somewhat or not glossy. Stems creeping, 5 cm or more long, branching irregularly pinnatifid, often stoloniferous at the ends, sending up numerous, erect or flexuose branches. Branches soft, 1-2 cm long, rather loosely imbricate. Stem leaves ovate to broadly ovate-lanceolate, abruptly acuminate, deeply plicate, almost entire; costa thin 3/4 length of leaf, sinking in the plication; median leaf-cells fusiform-hexagonal about $84 \times 8 \mu$ or more narrowly linear $97 \times 6.4 \mu$, basal and alar cells shorter and broader, quadrate to oblong-hexagonal. Branch leaves lanceolate, gradually tapering into acumen, deeply plicate, median leaf-cells somewhat shorter than those of the stem leaves. Seta smooth, varying in length 2-3.3 cm. Capsules oblong-cylindric, arcuate, suberect to horizontal, 2.4×1.1 mm. Peristome normal.

Specim. exam.: **Hokkaidō**. Prov. Kamikawa: Sōunkyō *Nog.* 27838. Prov. Iburi: Muro-ran *U.F.* 2976 (orig. specim. of *B. buchanani* var. *japonicum*). Prov. Ishikari: Jōzankei *Nog.* 30344, 30366. **Honshū**. Pref. Aomori: Shimokita *Nog.* 21275. Pref. Akita: Nagaki-mura *Nog.* 16565, Kawabe-gun, Iwamimiuchi-mura *Nog.* 15522, Nanukaichi-mura *Nog.* 15564, Mt. Komagatake *Kanno* 93. Pref. Yamagata: Tsuruoka-shi *Nog.* 16335, Nishitagawa-gun *H.O.* 1680, Muika-machi *Igura* 126. Pref. Miyagi: Sendai-shi *Nog.* 4462, Matsushima *Mizs.* 3063, Mt. Ōmori *Nog.* 4355. Pref. Fukushima: Mt. Rhōzen *Ikeg.* 33846. Pref. Gumma: Mt. Myōgi *Mizs.* 4252, Ushi pass *Mizs.* 4261. Pref. Chiba: Katsuura *Mizs.* 6269, Mt. Kiyozumi *Nog.* 23261, *Tak.* 1227, 1192, 1167, 1264, 1216, 1213, Mt. Nokogiri *Asano* 96, Kambe-mura *Asano* 87, Tōjō-mura *Nog.* 23494. Pref. Tōkyō: Mt. Takao *Tak.* 1031, Mt. Takamizu *Tak.* 1577, Nippara *Ikeg.* 21192, Hommonji *Tak.* 1131, Fuchū-shi *Mizs.* 7560, Nishitama-gun *Mizs.* 529, Iruma-gun *Mizs.* 6731, Minamitama-gun *Mizs.* 4192. Pref. Saitama: Mt. Bukō *Nag.* 5148, Mt. Mitsumine *Tak.* 4503, Ōmiya-shi *Tak.* 651. Pref. Niigata: Nishikubiki-gun *Ikeg.* 26657, Nishikambara-gun *Ikeg.* 8271, Higashikambara-gun *Ikeg.* 9225, Kitakambara-gun *Ikeg.*

3) *Brachythecium salebrosum* var. *rostratum* Besch. in *Ann. Sci. Nat.* ser. 7, 17: 373 (1893).

9655, Niigata-shi *Ikeg.* 17629, Iwafune-gun *Ikeg.* 19688, Kariwa-gun *Ikeg.* 8308, Is. Sado *Ikeg.* 21815. Pref. Nagano: Sugadaira *Tak.* 723, Kirigamine *Tak.* 6398. Pref. Shizuoka: Amagi pass *Nag.* 2680, Iwata-gun *Mizt.* 118, Ushizuma *Tak.* 10779. Pref. Aichi: Mt. Ryūtō *Tak.* 7664, Makihara *Tak.* 4161, Toyone-mura *Tak.* 12898, Sakurabuchi *Tak.* 11223, Taguchi-machi *Tak.* 7432, 10894, Kamitsugu-mura *Tak.* 10915. Pref. Shiga: Samegai *Nak.* 6220, Sakamoto-mura *Toy.* 907. Pref. Mie: Ujiyama *Mag.* 130, Isshi-gun *Mag.* 2288, Shima *Mag.* 2126. Pref. Nara: Mt. Tōnomine *Nak.* 3315, Mt. Kongō *Mizt.* 787. Pref. Kyōto: Nishihomme-mura *Nak.* 5383, Kibune *Toy.* 199, Arashiyama *Toy.* 540, Ashiu *Mizt.* 266, Mt. Kurama *Tak.* 645. Pref. Ōsaka: Mt. Kongō *Nak.* 2126, Mt. Ushitaki *Ikeg.* 7593, Mt. Katsuragi *Nog.* 26892, Minamikawachi *Mizt.* 3450, Mt. Nosemyōken *Nak.* 5388, Nishinose-mura *Nak.* 3680, Shimamoto-machi *Mizt.* 2639, Mt. Minoo *Ikeg.* 7777, Kagata-mura *Mizt.* 2566, Tanoura-machi *Nog.* 26891. Pref. Wakayama: Nishimuro-gun *Ikeg.* 1907, Mt. Kōya *Nak.* 1619. Pref. Hyōgo: Chikusa-mura *Nog.* 26156, Mt. Futatabi *Tak.* 7376, 7372, Yasushi-mura *Nog.* 20958, 22343, 22344, Mt. Funakoshi *Nak.* 3417, Arima *Ikeg.* 7926, Shiso-gun *Nog.* 20928. Pref. Okayama: Kurashiki-shi *Nog.* Nak. 3417, 19731, 28616, Niimi-shi *Nog.* 29105, Okayama-shi *Igi* 1773, Ishigazato *Igi* 209, Maniwa-gun *Nog.* 24158, Jōbō-gun *Nog.* 24163. Pref. Hiroshima: Sandankyō *Nog.* 8853, Mt. Kammuri *Nog.* 7355, Taishakukyō *Igi* 673, Hiroshima-shi *H.O.* 498. Pref. Tottori: Tottori-shi *H.O.* 4, Mt. Daisen *H.O.* 1017. Pref. Shimane: Matsue-shi *Nog.* 29044, 29045, Is. Oki *Nog.* 26790, Anno-gun *Ikeg.* 1203. **Shikoku.** Pref. Ehime: Nii-gun *Nog.* 23792, 23797, 23793, 23777, 23781, 23789, *K.O.* 163, Uma-gun *Nog.* 23790, Saijō-shi *K.O.* 413, Ochi-gun *K.O.* 2211, Shūsō-gun *K.O.* 5738, Onsen-gun *Mizs.* 6116, Kamo-mura *K.O.* 2868. **Kyūshū.** Pref. Ōita: Mt. Yufu *Nog.* 14002, Handa-mura *Nog.* 20677, Yufuin-mura *Nog.* 16639, Mt. Nakamatohata *Nog.* 28236, 28243, Kawanobori-mura *Nog.* 14077, Usa *Nog.* 9053, Mori-machi *Nog.* 18535, Hida-shi *Nog.* 15229, Mt. Kujū *Nog.*, Nakano-mura *Nog.* 15372, Tenjinyama *Nog.* 20639. Pref. Kumamoto: Kumamoto-shi *Tak.* 2488, 4372, Mt. Tawara *Tak.* 1579, Mt. Shakain *Tak.* 2366, Mt. Fukaba *Tak.* 2555, 2556, 2618, 2631, 2642, Mt. Shiraga *Nog.* 5264, Todoroki-mura *Tak.* 4342, Ashikita-gun *Tak.* 2920, Mt. Kunimi *Tak.* 2917, Mt. Onidake *Tak.* 2938, Isshōchi *Nog.* 13711, 18741, Ichibu *Mayeb.* 1930, Kōnose *Mayeb.* 202, Hitoyoshi *Mayeb.* 1311, Mt. Ichibusa *Mayeb.* 489, Mt. Ōhira *Mayeb.* 456, Aida *Mayeb.* 1928, Watari *Mayeb.* 1380. Pref. Kagoshima: Is. Sakurajima *Nog.* 20269, *Tak.* 8137, Mt. Shibi *Nog.* 18779. Pref. Miyazaki: Mt. Aoidake *Nog.* 4350, Hetsuka *Nog.* 8564, 8774, Mt. Sobo *Nog.* 2456, Mt. Futakami *Nog.* 16610, Kitagō-mura *Nog.* 18117, Sakatani-mura *Nog.* 18244, Sanno-mura *Nog.* 33788.

Range: Himalaya, Nepal, Bhutan, Assam, Korea and Japan (Hokkaidō, Honshū, Shikoku and Kyūshū).

The type locality of this species is India. It is our commonest species and very variable in habit and size. The var. *japonicum* was described by Cardot based on the syntype specimens from various parts of Honshū and Island of Quelpart. Cardot stated this variety is separable from the type by the robust size of plant, deep plication, and dense areolation consisting of narrower leaf-cells. These original specimen of this variety and a lot of Japanese specimens have been examined by the author, and it has revealed that these characters are very variable, and it is difficult to draw the line between the typical form of *buchanai* and its var. *japonicum*.

13 a) var. *gracillimum* Dix.

Brachythecium buchanani var. *gracillimum* Dix. in Rev. Bryol. 4: 156 (1931); Sakurai, l.c. 135 (1954).

Brachythecium kuroishicum Besch. var. *minus* Card. in Bull. Soc. Bot. Gen. ser. 2, no. 7 (1911); Sakurai, l.c. 135 (1954). Syn. nov.

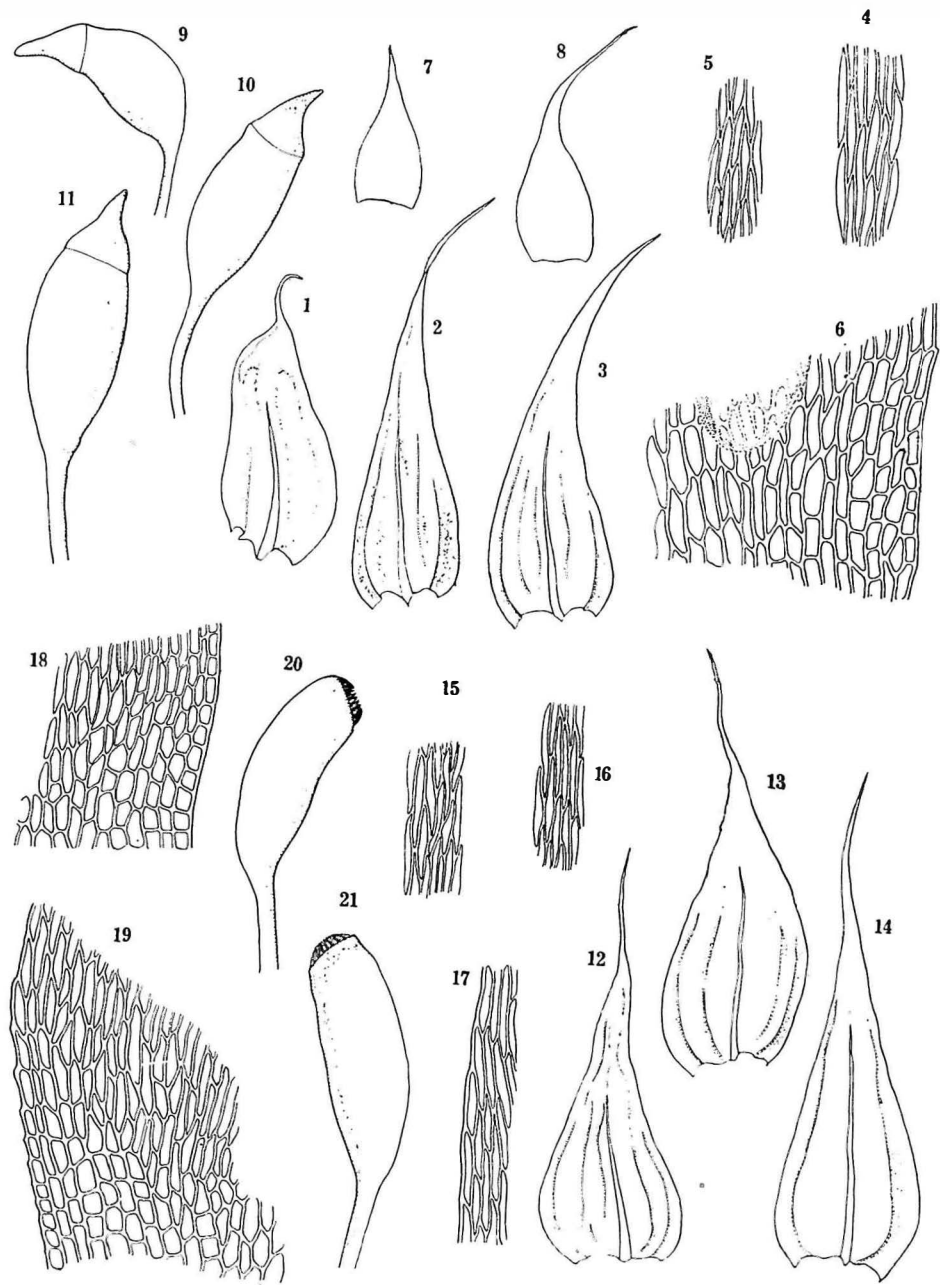


Fig. 14.

Plants very slender, delicate, soft and procumbent. Stems creeping, irregularly divided, much elongated, usually ending in flagelliform. Branches very short 2-5 mm. Leaves small and concave, less plicate; costa beyond the middle of leaf, decurrent, areolation as in the type. This variety passes, however, into the type by the gradation of each characters mentioned above.

In examining the original specimens of *B. kuroishicum* var. *minus* described by Cardot, the author has found they constitute compactly mixed specimens of two species *B. buchanani* var. *gracillimum* and *B. populeum*; both much resembling each other in their appearance so that they look at a glance to be one species. *B. populeum*, in spite of the smallness of this specimen, is distinguished by the costa reaching apex. Leaving *B. populeum* out, we can find that the rest is small mosses closely agreeing with *B. buchanani* var. *gracillimum*.

Specim. exam.: **Honshū**. Pref. Saitama: Mt. Bukō, *Nag.* 1951, Ōchigawa *Nag.* 150. Pref. Ibaraki: Mt. Tsukuba *Sas.* 4824 (orig. specim.). Pref. Nagano: Southern Alps, Todai *Tak.* 9791, 9798. Pref. Nara: Mt. Misen *Nog.* 29125. Pref. Shiga: Mt. Ryōzen *Nak.* 6262, Mt. Ibuki *Tak.* Pref. Kyōto: Mt. Hiei *Nog.* 26051. Pref. Ōsaka: Mt. Minoo *Ikeg.* 7877. Pref. Wakayama: Tanabe *U.F.* 2015 (orig. specim. of *B. kuroishicum* var. *minus*). Pret. Okayama: Jōbō-gun *Igi* 1755. **Kyūshū**. Pref. Kumamoto: Kumamoto-shi *Tak.* 2474. Pref. Ōita: Mt. Kujū *Nog.* 26419. Pref. Miyazaki: Sakatani-mura *Nog.* 18287. **Formosa**. Prov. Taichū: Taikwan *Nog.* 11962.

Range: Japan (Honshū and Kyūshū) and Formosa.

13 b) var. *sawadae* (Card.) Takaki stat. nov. (Fig. 14)

Brachythecium Sawadae Card. in Bull. Soc. Bot. Gen. ser. 2, 3: no. 7 (1911); Broth. in Engler, Pfl.-fam. 11: 361 (1925); Sakurai, l.c. 136 (1954). Syn. nov.

In describing *B. Sawadae*, Cardot stated the following points as the important characters of this species; silky gloss of plants, short seta (6-10 mm), small capsules, etc. *B. buchanani* varies as mentioned above, extensively in its characters both in gametophyte and sporophyte. Accordingly, such specific features of *sawadae*, pointed out by Cardot, seems to be included within the range of variation of *buchanani*. An examination of the original specimen of *sawadae* has revealed that it closely agrees with the type of *B. buchanani*, except the characters pointed out by Cardot. Thus, the author considers it as a variety of *B. buchanani*. A very rare variety, only found in the localities mentioned below.

Specim. exam.: **Honshū**. Pref. Iwate: Morioka *U.F.* 282 (orig. specim. leg. Sawada).

Fig. 14.

1-11. *Brachythecium buchanani* (Hook.) Jaeg. (orig. specim. of *B. buchanani* var. *japonicum*)

12-21. *B. buchanani* var. *sawadae* (Card.) Takaki (orig. specim.)

1. Stem leaf ($\times 24$). 2, 3. Branch leaves ($\times 24$). 4. Median cells of stem leaf ($\times 155$).
5. Median cells of branch leaf ($\times 155$). 6. Basal angle of stem leaf ($\times 155$). 7, 8. Perichaetial bracts ($\times 24$). 9, 10, 11. Capsules ($\times 12$). 12, 13. Stem leaves ($\times 24$). 14. Branch leaf ($\times 24$). 15. Median cells of stem leaf ($\times 155$). 16. Median cells of branch leaf ($\times 155$). 17. Marginal part of stem leaf ($\times 155$). 18. Basal angle of stem leaf ($\times 155$). 19. Basal angle of branch leaf ($\times 155$). 20, 21. Capsules ($\times 12$).

Pref. Kyōto: Mt. Washimine *Mizt.* 3667. **Shikoku.** Pref. Ehime: Yuyama-mura *Nog.* 25140. **Kyūshū.** Pref. Ōita: Yabakei *Ikeg.* 13283.

Range: Japan (Honshū, Shikoku and Kyūshū).

14. *Brachythecium glareosum* (Bruch.) Bryol. Eur.

Brachythecium glareosum (Bruch) Bryol. Eur. fasc. 52-54, pl. 552 (1853); Broth. l.c. 361 (1925); Sakurai in Bot. Mag. Tokyo, 46: 742 (1932); Musci Jap. 135 (1954).

Hypnum glareosum Bruch in sched.: C. Muell. Syn. 2: 361 (1851).

On the features of this species it is treated already in many publications. In having the dioicous inflorescence, plicate and longly acuminate leaf with nearly entire margins, this closely resembles *B. salebrosum*, but differs in the larger habit and having leaves usually less strongly serrated. This species is allied also to *B. buchananii*, but is distinguished from the latter, by the larger size of plant, leaves with more slenderly acuminate and twisted filiform acumen, and shorter capsules.

Specim. exam.: **Honshū.** Pref. Aomori: Shimokita, Tanabe *Nog.* 21040. Pref. Iwate: Mt. Hayachine *Ando* 14262. Pref. Nagano: Mt. Asama *Mizs.* 2950, Southern Alps, Koshi-buyu *Tak.* 6662, Sugadaira *Tak.* 749, Ōshika-mura *Tak.* 12111. Pref. Mie: Akame *Tak.* Pref. Okayama: Kurashiki *Nog.* 20501. **Kyūshū.** Pref. Ōita: Mt. Yufu *Nog.* 14360.

Range: Europe, Caucasus, Siberia, North America and Japan.

15. *Brachythecium kuroishicum* Besch. (Fig. 15)

Brachythecium kuroishicum Besch. in Ann. Sci. Nat. ser. 7, 17: 373 (1893); Paris in Bull. Herb. Bois. ser. 2, 2: 931 (1902); Broth. l.c. 362 (1925); Dixon in Rev. Bryol. 4: 158 (1931); Sakurai in Bot. Mag. Tokyo, 46: 742 (1932); Musc. Jap. 135, pl. 54-k (1954).

Hypnum kuroishicum (Besch.) Broth. in Hedwigia 38: 238 (1899).

Brachythecium decurrentifolium Broth. ex Sakurai in Bot. Mag. Tokyo, 46: 381 (1932); Musc. Jap. 136, pl. 54-n (1954). Syn. nov.

Brachythecium Momoseanum Sakurai in Bot. Mag. Tokyo, 50: 622, f. 12 (1936); Musc. Jap. 135 (1954). Syn. nov.

In yellowish green or bright green tufts. Stems creeping, radiculose. Branches obtuse, julaceous, unequal, 1-15 cm high, with closely imbricate leaves. Stem leaves widely ovate-lanceolate, abruptly acuminate to a rather long, fine, hyaline point, 2-2.3×0.8-0.85 mm, plicate, shortly decurrent. Branch leaves narrowly ovate-lanceolate, more gradually acuminate, closely imbricate, julaceous, faintly plicate, entire or finely denticulate above, costa 1/2-2/3 length of leaf, median leaf-cells linear-oblong, 80-110 μ long, 8-12 times as long as broad, slightly obtuse, gradually becoming shorter and wider towards base, at base pellucid, oblong-rhomboidal to quadrate, inflated. Seta smooth, varying in length 5-15 mm long. Capsules dark-brown, sometimes black, oblong-ovoid, 1.3-1.7 mm long, 0.8-1.0 mm

Fig. 15. *Brachythecium kuroishicum* Besch. (1-8: orig. specim.; 9-16: orig. specim. of *B. decurrentifolium*)

1, 2. Stem leaves (×35). 3, 4. Branch leaves (×19). 5. Median cells of stem leaf (×155). 6. Basal angle of stem leaf (×155). 7, 8. Capsules (×12). 9, 10. Stem leaves (×19). 11, 12. Branch leaves (×19). 13. Median cells of stem leaf (×155). 14. Basal angle of stem leaf (×74). 15. Ditto (×155). 16. Capsules (×9).

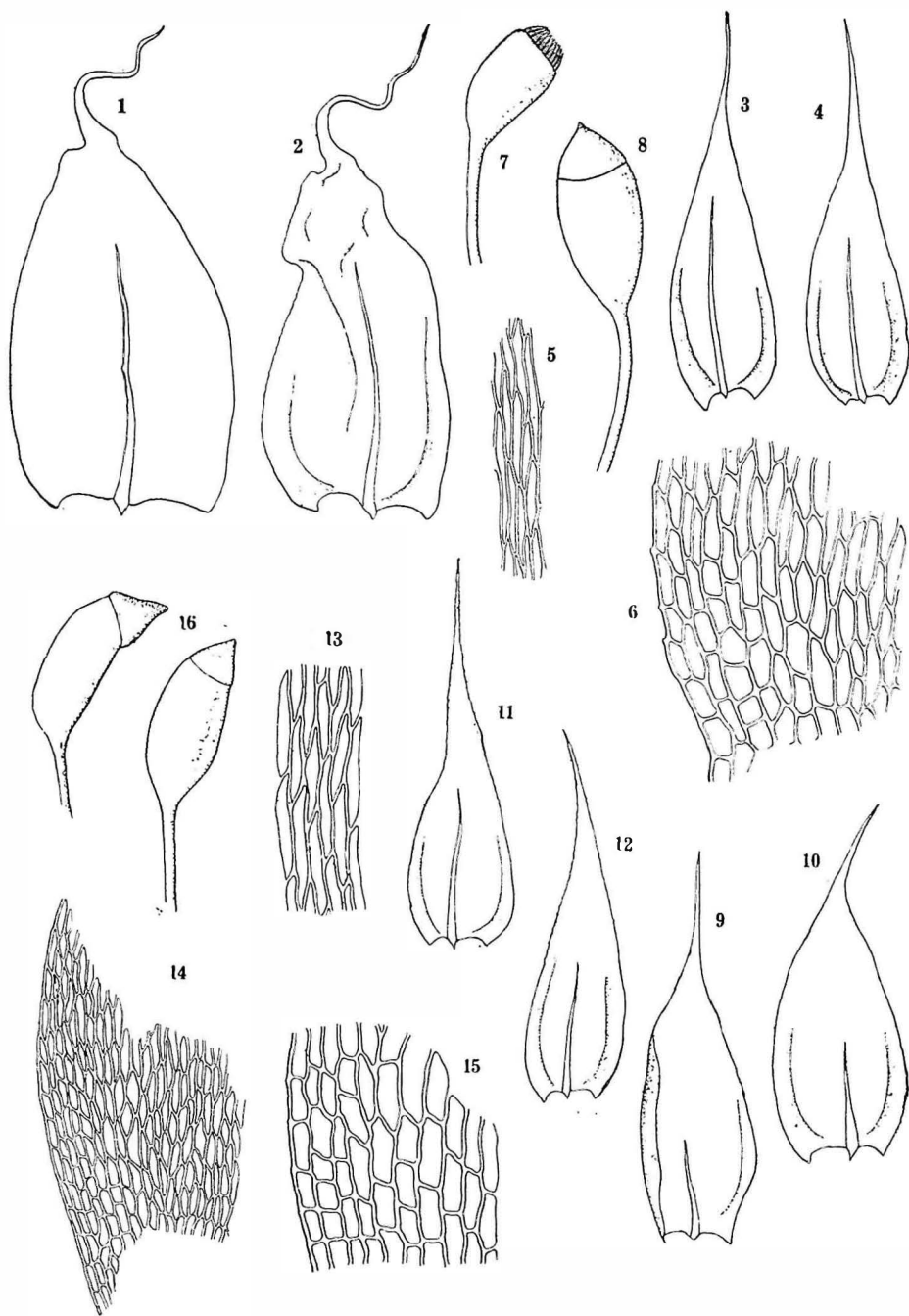


Fig. 15.

thick, not at all contracted under the mouth when dry, inclined or often nearly erect, nearly symmetric. Operculum conic, apiculate. Autoicous.

Specim. exam.: **Hokkaidō**. Prov. Abashiri: Abashiri *Nog.* 12604, 12605, Kitami-shi *Nog.* 30200. Prov. Kushiro: Mt. Oakan *H.O.* 1257, Mt. Meakan *Nog.* 28066, 28071, 28100, Teshikaga *Ando* 2751. Prov. Kamikawa: Furano *Ando* 3128, Kamuikotan *Nog.* 30129, Nishishibetsu *Nog.* 26603, 26611. Prov. Ishikari: Jōzankei *Nog.* 29978, 30367. Prov. Shiribeshi: Otaru *U.F.* 99 (orig. specim. of *B. kuroishicum*). Prov. Oshima: Hakodate *Nog.* 30177. **Honshū**. Pref. Aomori: Nishitsugaru-gun *Mizs.* 9104, Tanabe *Nog.* 21049, 21158, 21235, Sai *Nog.* 21287, Okuuchi *Nog.* 21463, Yagen *Nog.* 20988. Pref. Miyagi: Omori *Nog.* 4355. Pref. Fukushima: Yama-gun *Ando* 14756. Pref. Gumma: Oze *Mizs.* 1240. Pref. Toyama: Kaminiikawa-gun, Ōyama-mura *Sak.* 2126 (orig. specim. of *B. decurrentifolium*). Pref. Yamanashi: Mt. Fuji 1100 m *Tak.* 9155. Pref. Nagano: Sugadaira *Tak.* 817, Mt. Shirouma *Tak.* 9405, Southern Alps, Todai *Tak.* 11578, 11624, Kirigamine *Tak.* 6397, 6399, 8817, Mt. Hachibuse *Sak.* 7861 (orig. specim. of *B. momoseanum*). Pref. Aichi: Mt. Chausu *Tak.* 12973. Pref. Hiroshima: Kōnan-son *Nog.* 12048.

Range: Japan (Hokkaidō and Honshū).

In having the julaceous branches, looser areolation of leaf and the costa which is stout at base but abruptly weakens upwards, this species resembles *B. helminthocladum*. However, it is readily distinguished from it by the gradually tapering leaf-form and autoicous inflorescence. It is distributed chiefly in northern Japan, and it makes a marked contrast to *B. helminthocladum* as has been pointed out.

This species also resembles *B. salebrosum* in habit, form and size of leaf, form of leaf-cell, long plication of leaf and autoicous inflorescence, etc., but it differs from the latter by the nearly entire margins and looser basal areolation of leaf.

The name *B. decurrentifolium* was given at first by Brotherus in manuscript, and afterwards made effective by Sakurai as a species of the sect. *Rutabula*. An examination of the original specimen of this species has led the author to consider that there is no distinction between this and *B. kuroishicum*. The species *B. momoseanum* is also conspecific with *B. kuroishicum*.

15 a) var. *littorale* Card. (Fig. 10)

Brachythecium kuroishicum var. *littorale* Card. in Bull. Soc. Bot. Gen. ser. 2, 3: no. 7 (1911); Sakurai, l.c. 135 (1954).

By the cylindrical, nearly erect capsules and terete foliation of branches, it much resembles *B. roteanum*, but the median leaf areolation is not so loose as in the latter, and in this respect it agrees on the other hand, with *B. kuroishicum*.

Specim. exam.: **Hokkaidō**. Prov. Shiribeshi: Otaru *U.S.* 3561 (orig. specim.)

Range: Japan (Hokkaidō).

15 b) var. *parvicarpum* (Besch.) Takaki comb. nov.

Brachythecium salebrosum var. *parvicarpum* Besch. in Ann. Sci. Nat. ser. 7, 17: 373 (1893); Paris in Bull. Herb. Bois. ser. 2, 2: 931 (1902); Sakurai, l.c. 136 (1954). Syn. nov.

Much diminutive in size. Branches short, attaining 3–4 mm long, 1–1.5 mm thick, obtuse, terete-foliate. The characters of leaf agree well with those of the type. Capsules small, brown, ovoid, usually inclined.

This was at first described as a variety of *B. salebrosum*. But it has a nearly

entire leaf-margin and looser areolation of leaf-base, and in these respects, the author decided it as a variety of *B. kuroishicum*.

Specim. exam.: **Honshū**. Pref. Aomori: Aomori *U.S.* 182 (orig. specim. of *B. salebrosum* var. *parvicarpum*).

Range: Japan (Honshū).

16. *Brachythecium piligerum* Card. (Fig. 16)

Brachythecium piligerum Card. in Bull. Soc. Bot. Gen. ser. 2, 3: no. 7 (1911); Broth. in Engler, Pfl.-fam. 11: 352 (1925); Sakurai Musc. Jap. 135 (1954).

Plants in rather loose glossy light-green mats. Stems creeping, 4 cm or more long, radiculose, irregularly branching. Branches erect or ascending, 1-2 cm long, somewhat divergently foliate. Branch leaves more or less erect-patent when dry, lanceolate to ovate-lanceolate, slenderly long-acuminate, about 3.4×1.6 mm, decurrent, very concave, scarcely plicate; costa thin, extending not beyond middle; margins nearly entire or finely serrulate above; median leaf-cells pale yellow, linear-fusiform, $90-100 \times 6.4-8.0 \mu$, basal cells much broader and shorter, extreme alar cells subquadrate or ovoid-rhomboidal, loosely areolated. Seta about 14 mm long, dark-brown, smooth. Capsules suberect or inclined, dark-brown, oblong-ovoid, $2 \times 0.9-1.0$ mm. Peristome normal. Dioicous.

Specim. exam.: **Hokkaidō**. Is. Rishiri: Porofunbetsu *Hatt.* 21894. Prov. Ishikari: Jōzankei *Nog.* 29979, 29985, Nopporo *Nog.* 15614. **Honshū**. Pref. Yamagata: Kitamurayama-gun *Nog.* 16300, Mt. Zaō *Igura* 276. Pref. Iwate: Mt. Hayachine *U.F.* 3244 (orig. specim.). Pref. Niigata: Mt. Yahikoyama *Nog.* 21994, Nishikambara-gun *Ikeg.* 8301. Pref. Nagano: Kirigamine *Tak.* 6543, 6545. Pref. Shimane: Miinohara *Nog.* 22259.

Range: Japan (Hokkaidō and Honshū)

This much resembles *B. kuroishicum* in habit, looser areolation of leaf base, but differs in having dioicous inflorescence, less plicate leaves and longer and piliform acumen.

17. *Brachythecium moriense* Besch. (Fig. 16)

Brachythecium moriense Besch. in Ann. Sci. Nat. ser. 7, 17: 375 (1893); Broth. l.c. 361 (1925); Reimers & Sakurai in Bot. Jahrb. 64: 551 (1931); Dixon in Rev. Bryol. 4: 158 (1931); Sakurai, l.c. 135 (1954).

Closely resembling *B. buchanani* in habit. Stems creeping, densely radiculose throughout. Branches 15 mm long, 1 mm thick, erect, simple or slightly divided, subjulaceous, densely radiculose, attenuate. Stem leaves widely ovate-lanceolate or cordate-lanceolate, abruptly narrowing to a long, flexuose acumen, 2.3×1.0 mm, very concave, less plicate, often transversely undulate above; costa $2/3$ length of leaf, stout at base, rapidly weakens upwards, often reaching below acumen, flexuose; margins minutely serrulate all around; areolation loose and pellucid on the whole, median leaf-cells linear-hexagonal, $93-100 \times 9.6 \mu$, basal and alar cells much larger and forming a large pellucid area at base as shown in Fig. 16. Branch leaves lanceolate, gradually tapering to the slender and long acumen. Seta smooth, about 15 mm long, brown. Capsules oblong-ovoid, suberect or horizontal, $1.5-2.0 \times 0.7-0.8$ mm. Peristome normal. Dioicous.

Specim. exam.: **Hokkaidō**. Prov. Oshima: Mori *U.F.* 3510 (orig. specim.).

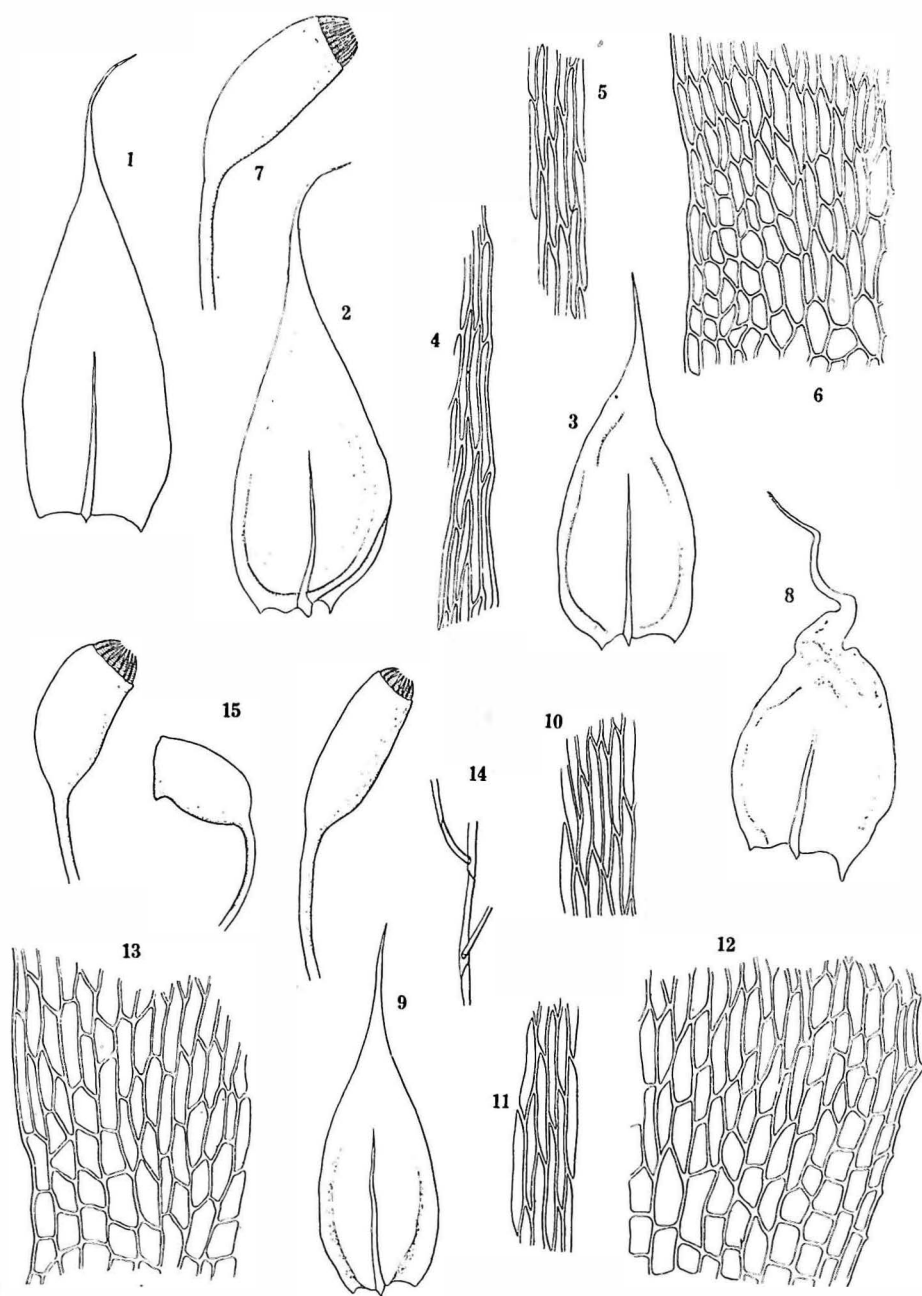


Fig. 16.

Range: Japan (Hokkaidō and Honshū).

The most striking characters of this species are the very loosely areolated leaves and densely radiculose branches. It is distinguished from *B. buchanani* by the less plicate leaves which have very loose areolation, especially in leaf base, and costa stout in its base, and shorter capsules. Very rare in Japan.

The following two varieties have been described under this species by Cardot, based on Faurie's collections in Japan. The author has been unable to find them in Faurie's collections preserved in the Herbarium of Kyoto University.

Var. *effusum* Card. in Bull. Soc. Bot. Gen. ser. 2, 4: 379 (1912); Sakurai, l. c. 135 (1954). Type locality: Hokkaidō. Otaru (U.F. 3758).

Var. *longirameum* Card. l. c. 3: no. 7 (1911); Sakurai, l. c. (1954). Type locality: Shikoku. Mt. Ishizuchi (U.F. no. ?).

Sect. *Rutabula* Limpr. Laubm. 3: 62 (1895)

Plants usually tall and robust. Leaves large, ovate-deltoid, usually shortly and rather broadly acuminate (except in *B. coreanum* and *B. pendulum*), less concave, somewhat plicate, sometimes decurrent, leaf cells linear-fusiform, not obtuse and not projecting at the upper ends. Seta robust, very rough throughout. Capsule with well-developed annulus. Resembling the genus *Bryhnia* in many respects, but the latter has leaf-cells rather short, broad and somewhat papillose by the projecting upper ends.

Key to the species

- 1 { Stems pendulous *B. pendulum*
- 1 { Stems creeping or ascending 2
- 2 { Calyptra hairy; leaves ovate-lanceolate, slenderly acuminate *B. coreanum*
- 2 { Calyptra naked; leaves cordate or deltoid-ovate 3
- 3 { Autoicous; leaves more or less decurrent *B. rutabulum*
- 3 { Dioicous; leaves strongly decurrent 4
- 4 { Leaves usually rather longly acuminate *B. calliergonoides*
- 4 { Leaves shortly acuminate *B. rivulare*

18. *Brachythecium pendulum* Takaki sp. nov. (Fig. 19)

Sterile. Planta robustiuscula, aureo-viridis, sericeo-nitida. Caulis primarius elongatus ad 10 cm longus, repens vel pendulus, flexuosus, vage radiculosus, laxe foliosus, remote subpinnatim ramosus, ramis patulis ca. 3–3.5 cm longis, laxe et

Fig. 16.

1– 7. *Brachythecium piligerum* Card. (orig. specim.)

8–15. *B. moriense* Besch. (orig. specim.)

1, 2. Stem leaves ($\times 19$). 3. Branch leaf ($\times 19$). 4. Marginal part of stem leaf ($\times 155$). 5. Median cells of stem leaf ($\times 155$). 6. Basal angle of stem leaf ($\times 155$). 7. Capsule ($\times 12$). 8. Stem leaf ($\times 24$). 9. Branch leaf ($\times 24$). 10. Median cells of stem leaf ($\times 155$). 11. Median cells of branch leaf ($\times 155$). 12. Basal angle of stem leaf ($\times 155$). 13. Basal angle of branch leaf ($\times 155$). 14. Rhizoid growing on branch ($\times 200$). 15. Capsules ($\times 12$).

complanate foliosis, simplicibus vel ramulosis, pendulis, caudiformiter attenuatis. Folia sicca patentia. Folia caulina late ovata vel ovato-lanceolata, sensim vel subsensim in acumen elongatum, angustum, apice subcapillare producta, ca. 3×1.3 mm, valde concava, basi haud decurrentia, marginibus ubique minutissime serrulatis, basi late recurvis; nervo valido, $1/2$ folii evanido; cellulis laminarum linearibus, flexuosis, laevibus, $110-130 \times 8-10 \mu$, sensim basin versus laxioribus et rhomboideis. Folia ramea oblongo-lanceolata, sensim acute acuminata, valde concava, ca. 2.3×0.8 mm; marginibus basi subintegris dein minute serrulatis, apice serratis; nervo $1/2-2/3$ folii evanido. Caetera ignota.

Specim. exam.: **Honshū**. Pref. Okayama: Atetsu-gun, Kurama-mura, Rashōmon *Tak.* 16288-Holotype, leg. C. Igi Nov. 2, 1954.

Range: Japan (Honshū).

Hab.: Growing on trunks of trees in calcareous district.

In having glossy, pendulous habit, distant and complanate foliation, it looks like a species of *Meteoriaceae*. But the characters of leaf agree well with those of the genus *Brachythecium*. In the whole respects, this species seems to be an akin to *B. coreanum*.

19. *Brachythecium coreanum* Card. (Fig. 17)

Brachythecium coreanum Card. in Bull. Soc. Bot. Gen. ser. 2, **3**: no. 7 (1911); Broth. l.c. 362 (1925); Sakurai, l.c. 136 (1954).

Brachythecium piliferum Broth. in Ann. Bryol. **1**: 23 (1928); Sakurai, l.c. 136, pl. 54-o (1954). Syn. nov.

Musci Japonici Exsiccati, ser. 5, no. 205 (1951).

Robust plant, forming a large, dense, pale green or yellowish green and often glossy tufts. Stems usually prostrate at base and thence ascending or erect, sending up closely aggregated branches which are unequal in length, attenuate, subjulaceous when dry. Stem leaves broadly ovate, rapidly and longly acuminate, usually somewhat concave, more or less decurrent, deeply plicate; margins denticulate all around; costa extending beyond the middle, median leaf-cells linear-fusiform, 6-8:1, basal cells much larger in length and breadth, extreme alar cells quadrate and numerous. Branch leaves narrower and more longly acuminate than in the stem leaves, more denticulate, costa extending $2/3$ length of the leaf. Perichaetial leaves ca. 3.7 mm long, with loosely sheathing base and spreading point, inner leaves exceedingly filiform-acuminate from an oblong base, slightly or often sharply denticulate above, thinly costate. Paraphyses very numerous, crowded and exceed the perichaetial bracts. Seta 20-22 mm long, reddish brown, very rough throughout. Capsules reddish brown, 2.2×0.9 mm, oblong-cylindric, slightly

Fig. 17. *Brachythecium coreanum* Card. (1-14: *Mayeb.* 490; 15-19. orig. specim.)

1. Stem leaf ($\times 13$). 2, 3. Branch leaves ($\times 13$). 4. Marginal part of stem leaf ($\times 155$).
5. Median cells of stem leaf ($\times 155$). 6. Basal angle of stem leaf ($\times 155$). 7. Perichaetium ($\times 9$).
- 8, 9. Perichaetial bracts ($\times 13$). 10. Paraphysis ($\times 44$). 11. Capsules ($\times 9$).
12. Peristome teeth ($\times 74$). 13. Spores ($\times 470$). 14. Calyptra ($\times 9$).
- 15, 16. Stem leaves ($\times 19$). 17. Marginal part of stem leaf ($\times 155$). 18. Median cells of stem leaf ($\times 155$).
19. Basal angle of stem leaf ($\times 155$).

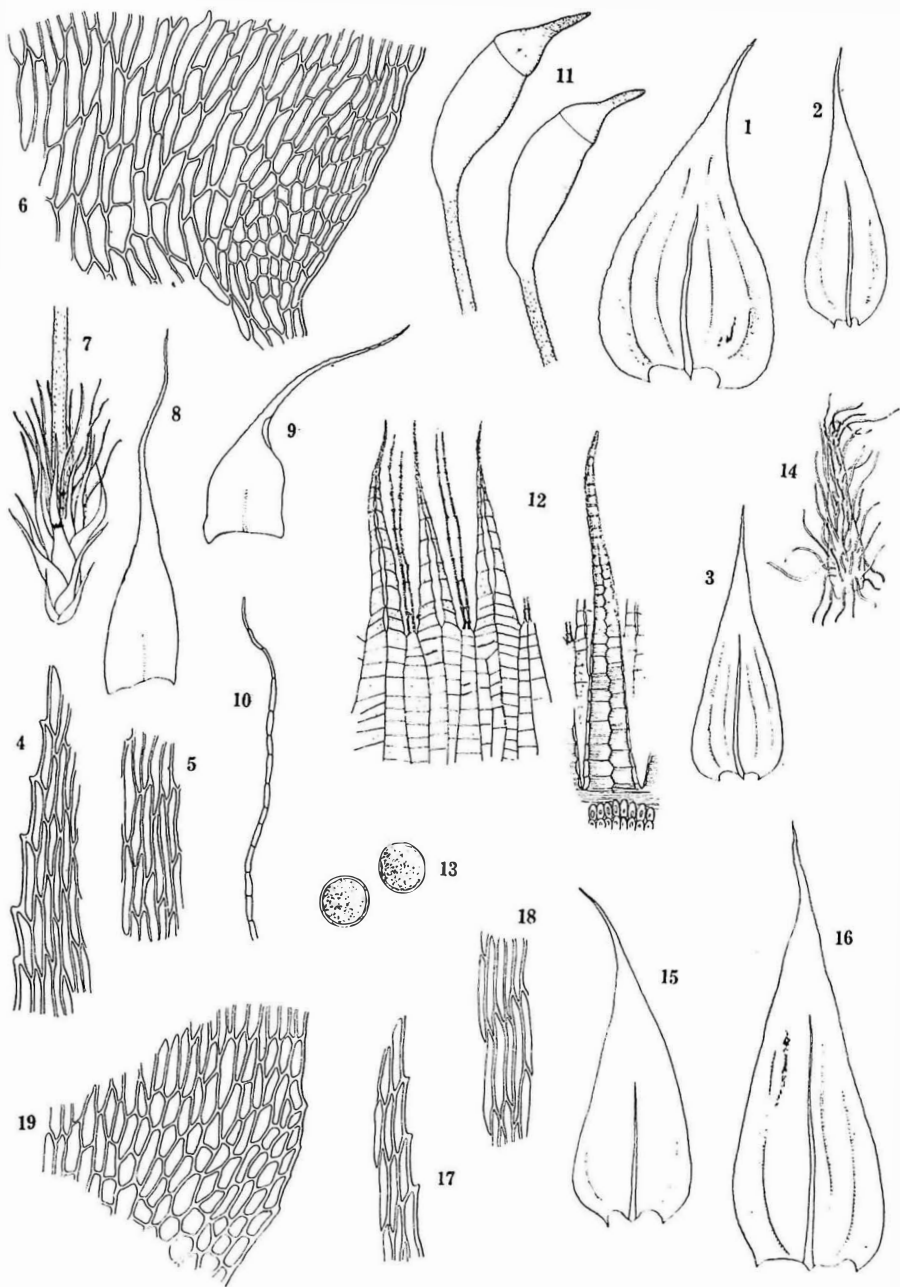


Fig. 17.

arcuate, inclined. Operculum longly conic to conic-rostrate. Annulus of two rows of cells. Teeth of peristome subulate-lanceolate, segments nearly as long as teeth, cilia 2, well developed, nodose and papillose-roughened. Spores nearly smooth. Dioicous.

Specim. exam.: **Honshū**. Pref. Aomori: Tanabe *Nog.* 21252. Pref. Akita: Hayaguchi-mura *Nog.* 15990. Pref. Yamagata: Mt. Asahi *Nog.* 25173, Mt. Chōkai *Mizs.* 6999. Pref. Miyagi: Mt. Taihaku *Nog.* 4354. Pref. Saitama: Mt. Mitsumine *Mizs.* 46. Pref. Tokyo: Iruma-gun *Mizs.* 6513, Asakawa *Mizs.* 4154, Minamitama-gun *Mizs.* 4157. Pref. Chiba: Kamemayama-mura *Asano* 48. Pref. Niigata: Kitakambara-gun *Ikeg.* 4570, Nakakambara-gun *Ikeg.* 9057, Higashikambara-gun *Ikeg.* 9719, Minamikambara-gun *Ikeg.* 1767, Nishikambara-gun *Ikeg.* 8270, Nishikubiki-gun *Ikeg.* 9840, Iwafune-gun *Ikeg.* 3058, Is. Sado *Ikeg.* 393, Kamoshiki *Ikeg.* 9272. Pref. Toyama: Kaminiikawa-gun, Osho-mura *Sas.* (orig. specim. of *B. piliferum*) Kurobe valley *Tak.* 14656, 14661. Pref. Ishikawa: Mt. Nakusan *Tak.* 9396. Pref. Nagano: Koshibuyu *Tak.* 6663, Harinoki pass, 1700 m *Tak.* 10471, Futamata *Tak.* 6889, 9466, 9487, 9514. Pref. Shizuoka: Senzu *Tak.* 10662. Pref. Aichi: Nagura-mura *Tak.* 11544, Mt. Danto *Tak.* 10717, 10688. Pref. Mie: Takihara-mura *Mag.* 2852, Ōsugi valley *Tak.* 5891, Mt. Ōdai *Mizt.* 582, Ujiyamada *Mag.* 473. Pref. Kyōto: Ashiu *Mizt.* 353, Arashiyama *Toy.* 382, Mt. Kurama *Toy.* Pref. Nara: Mt. Misen *Nak.* 2965, Mitsu *Nak.* 4647. Pref. Ōsaka: Mt. Katsuragi *Mizt.* 647, Mt. Kongō *Nak.* 2130, *Nog.* 26884. Pref. Tottori: Yazu-gun *H.O.* 923, Mt. Mitoku *Inoue* 9080, Mt. Daisen *Nog.* 22180. Pref. Shimane: Is. Oki *Nog.* 26874. **Shikoku**. Pref. Ehime: Mt. Ishizuchi *K.O.* 2750, Nii-gun *K.O.* 1598, Shūsō-gun *Mizs.* 6784, Umagun *K.O.* 2476. **Kyūshū**. Pref. Kumamoto: Mt. Fukaba *Tak.* 2588, Mt. Shakain *Tak.* 2371, Gokanoshō *Sugimoto* 2, Mt. Kunimi *Tak.* 2976, Mt. Shiraga *Nog.* 5183, Hitoyoshi *Nog.* 25753. Mt. Ōhira *Mayeb.* 449, Mt. Ichibusa *Mayeb.* 490, Uemura *Mayeb.* 2270, Isshochi *Mayeb.* 2012. Pref. Miyazaki: Mt. Obirano (Musc. Jap. Exsiccata no. 205). **Korea**. Tjyang-Tjyen *U.F.* 337, Haoang-hai-to *U.F.* 650 (orig. specim.).

Range: Japan (Honshū, Shikoku, Kyūshū) and Korea.

This was described by Cardot based on a sterile specimen from Korea. This is one of our common species, and is readily recognized by the glossy and compact branches with the imbricate leaves and by long acumen and deep plication of leaf. Moreover, the most striking characters of this species are the hairy calyptra and vaginula with numerous long paraphyses. We have few chance of seeing the calyptra, owing to its readily falling off, so the paraphyses of vaginula seem to be the convenient character for specific determination. This was classed by Brotherus as a member of the sect. *Salebrosa* in the "Pflanzenfamilien." But, its seta is very rough throughout, so it should be placed in the sect. *Rutabula*.

This resembles also *B. wichurae* in many respects, but is distinguished from the latter by the following points.

B. coreanum

1. Plants rigid, yellowish green to yellowish brown, usually with densely imbricate foliation.
2. Leaves lanceolate to ovate-lanceolate.
3. Basal areolation of leaf somewhat loose.
4. Paraphyses numerous and exceeding the perichaetium.
5. Seta rough.
6. Operculum longly conic.
7. Calyptra hairy.

B. wichurae

1. Plants soft and pale or whitish green with divergent foliation even in dry condition.
2. Leaves more broadly ovate-lanceolate.
3. Basal areolation of leaf much looser.
4. Paraphyses few, not exceeding the perichaetium.
5. Seta smooth.
6. Operculum shortly conic.
7. Calyptra naked.

20. *Brachythecium rivulare* Bryol. Eur. (Fig. 18)

Brachythecium rivulare Bryol. Eur. fasc. 52-54, pl. 546 (1853); Paris in Bull. Herb. Bois. ser. 2: 931 (1902); Broth. l.c. 363 (1925); Dixon in Rev. Bryol. 4: 158 (1931); Reimers & Sakurai in Bot. Jahrb. 64: 551 (1931) Sakurai, l.c. 136, pl. 54-j (1954).

Hypnum rivulare Bruch in sched.; Broth. in Hedwigia 38: 240 (1899).

Hypnum (Sect. *Brachythecium*) *cameratum* Mitt. sensu Mitt. in Trans. Linn. Soc. Lond. ser. 2, Bot. 3: 185 (1891). Syn. nov.

Brachythecium laticuspis Broth. ex Dixon in Rev. Bryol. 4: 159 (1931); Sakurai, Musc. Jap. 137 (1954). Syn. nov.

Calliergon Kawaguchii Sh. Okamura in Jour. Coll. Sci. Imp. Univ. Tokyo, 36: (7): 29, pl. 1, h-m (1915); Broth. in Engler, Pfl.-fam. 11: 348 (1925). Syn. nov.

Bryhnia Kawaguchii Sakurai in Bot. Mag. Tokyo, 50: 623 (1936); Musc. Jap. 138, pl. 52-c (1954). Syn. nov.

A distinct species, though variable pretty often. Readily recognized from the majority of its allied species by the following points: Secondary stems rigid, distantly foliate, sometimes sending up numerous flagelliform branchlets; leaves shortly acuminate, very concave, strongly decurrent; the cells of decurrent angles abruptly enlarged and inflated; leaves of secondary stems broadly ovate, abruptly and shortly acuminate, concave; dioicous.

Specim. exam.: **Hokkaidō**. Is. Rebun Iwaz. & Tak. 15039, 15070, Hatt. 21585, 21656, 20724, 21779. Is. Rishiri: Iwaz. & Tak. 15232, 15233. Prov. Kamikawa: Mt. Daisetsu Iwaz. & Tak. 15612, Ando 2981, Nishishibetsu Nog. 26601, Sounkyō Nog. 27797, 28128. Prov. Ishikari: Jōzankei Nog. 29976, 30381. **Honshū**. Pref. Aomori: Shimokita, Nohira Nog. 21412, Oirase Mizs. 4416, Mt. Hakkōda Mizs. 4421. Pref. Akita: Mt. Komagatake Kanno 73. Pref. Iwate: Yabukawa-mura Nog. 25618, Iwate-gun Mizs. 6429. Pref. Fukushima: Kawanuma-gun Mizs. 6429. Pref. Miyagi: Sendai *Ihsila* (orig. specim. of *B. laticuspis*). Pref. Gumma: Ozawa-mura Toy. 936, Oze Mizs. 2728, Tone-gun H.O. 181. Pref. Tochigi: Nikkō Bisset (det. Mitten as *Hypnum cameratum*), Chūzenji Jigoku-jaya Okamura (orig. specim. of *Calliergon Kawaguchii*), Uraminotaki Tak. 506, Shirakumonotaki Tak. 1573. Pref. Saitama: Mikuni pass Nag. 4913, Chichibu Mizs. 3649. Pref. Tōkyō: Nishitama-gun Mizs. 2856. Pref. Niigata: Kitauonuma-gun Mizs. 3488, Minamiuonuma-gun Ikeg. 18096, Kitakambara-gun Mizs. 1917, Nakakambara-gun Ikeg. 12128. Pref. Nagano: Southern Alps, Shiozawa Tak. 11745, 11765, Ōshika-mura Tak. 12142, Koshibuyu Tak. 6687, 6702, Sampukuzawa Tak. 14990, Mt. Shiomidake 2300 m Tak. 14994, Mt. Senjō 2500 m Tak. 10050, Northern Alps Harinoki pass 1600 m Tak. 10481, Kamikōchi Mizs. 8393, Tadeshina Mizs. 8543, Sugadaira Tak. 775, 820, 726, 1316, 1317, 1318, 1328, 1331, 1334, 1350, Mt. Kisoontake Mizs. 7049, Mt. Asama Mizs. 2960, Kirigamine Tak. 6322, Mt. Yatsu Mizs. 432. Pref. Shizuoka: Jōren fall Tak. 8054. Pref. Aichi: Mt. Chausu Tak. 12971, 12859, Miwa-mura Tak. 6133. Pref. Gifu: Shirakawa-mura Tak. 9222. Pref. Kyōto: Kibune Toy. Kitakuwata-gun Nak. 5536, Kamitakano Nog. 27756. Pref. Ōsaka: Mt. Kongō Mizt. 820, Mt. Iwawaki Nak. 2492, Mt. Katsuragi Nak. 1902. Pref. Nara: Kawakami-mura Mizt. 470. Pref. Hyōgo: Mt. Myōken Nak. 2791, Mt. Funakoshi Nak. 3425. Pref. Mie: Nonobori Mag. 175. Pref. Wakayama: Mt. Kōjin Nak. 3251. Pref. Tottori: Mt. Daisen Nog. 22181, Yazu-gun H.O. 1531. Pref. Okayama: Ushiroyama Nog. 27549, Izumiyama Nog. 24721. **Shikoku**. Pref. Ehime: Nii-gun K.O. 875, Kadono-mura K.O. 726, Uma-gun K.O. 2515. **Kyūshū**. Pref. Kumamoto: Mt. Naidaijin Tak. 319, Mt. Ichibusa Toy. 507, Gokanoshō Tak. 1571, Kawaharu-mura Tak. 1569, 2102, 2856, Mt. Aso Tak. 1565. Pref. Ōita: Tenjinyam Nog. 20649, Beppu Nog. 27253, Mt. Kujū Tak. 125, Nog. 3027, 4351, Mt. Nakamatohata Nog. 28171, 28246, Otobaru Nog. 14043. Pref.

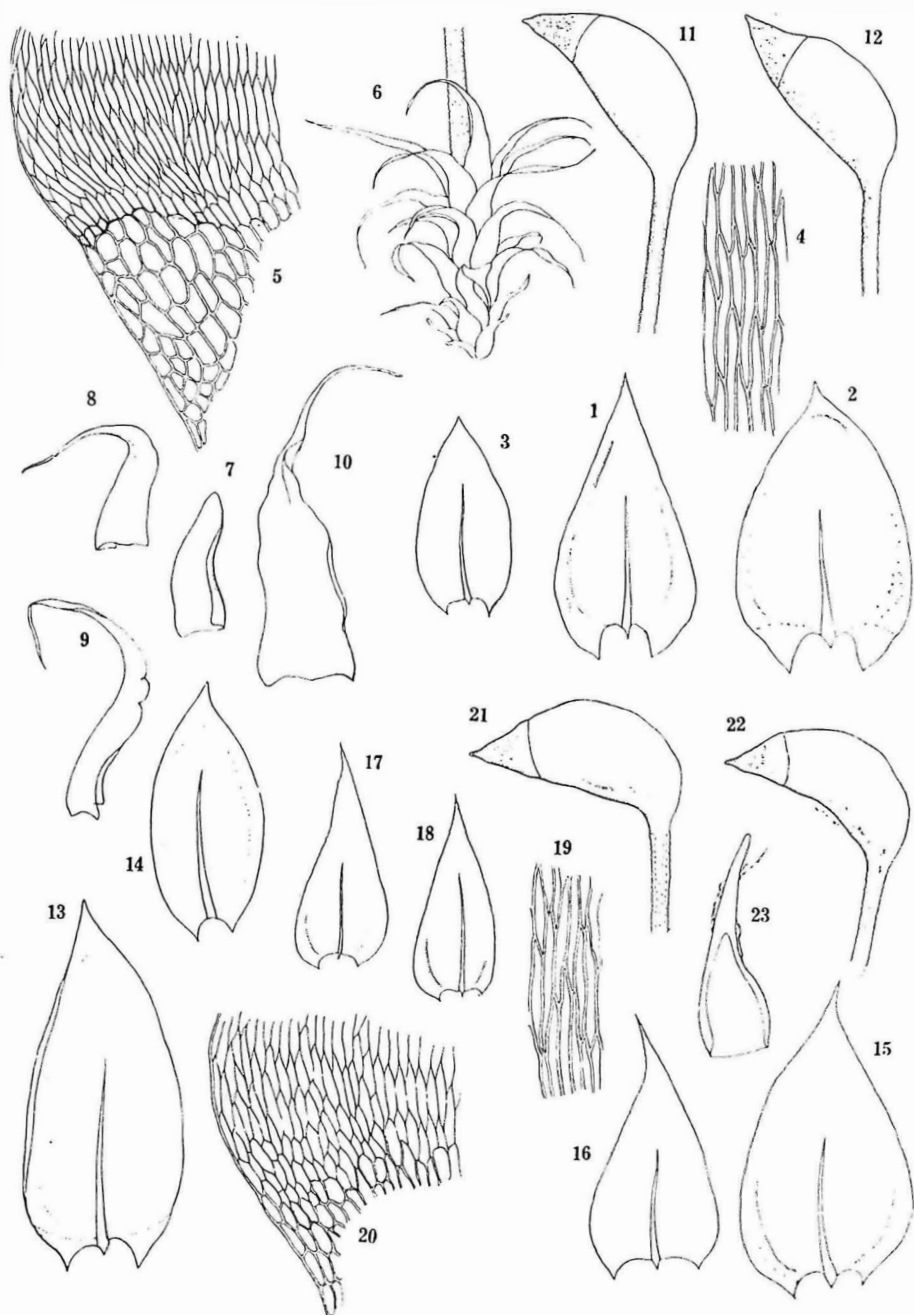


Fig. 18.

Miyazaki: Mt. Sobo *Nog.* 3211, 26233, Mt. Futagami *Nog.* 16590. **Formosa.** Prov. Taihoku: Mt. Taihei *Nog.* 6328, 6562, 6563.

Range: Europe, Madeira, Caucasus, Central and Northern Asia, North America, Japan (Hokkaidō, Honshū, Shikoku, Kyūshū), and Formosa.

The species *Hypnum cameratum* (= *Cirriphyllum cameratum*), a Himalayan moss, was reported from Japan (Nikkō, Middl Japan) in 1891 by Mitten as a new locality. The author was able to examine the specimen from Nikkō, by the courtesy of New York Botanical Garden, and has found that this is nothing but *B. rivulare*.

In describing *B. laticuspis*, Dixon stated that "this plant has the habit and microscopic characters of smaller forms of *Scleropodium illecebrum* and is indeed scarcely separable from it except by the areolation which is quite different, all the basal cells being lax and pellucid and the upper, while variable in width, entirely different, more or less rhomboid, and sometimes quite widely rhomboid." This description is also applicable to *B. rivulare*. In fact, an examination of the original specimen has revealed that this specimen well agrees with *B. rivulare*.

21. *Brachythecium rutabulum* (L.) Bryol. Eur. (Fig. 18)

Brachythecium rutabulum (L.) Bryol. Eur. fasc. 52-54, pl. 54 (1853); Besch. in Ann. Sci. Nat. ser. 7, 17: 376 (1893); Paris in Bull. Herb. Bois. ser. 2, 2: 931 (1902); Broth. l.c. 363 (1925); Reimers & Sakurai in Bot. Jahrb. 64: 551 (1931); Sakurai, l.c. 136, pl. 54-b (1954).

Hypnum rutabulum L. Sp. Pl. 1124 (1753); Broth. in Hedwigia 38: 240 (1899).

A cosmopolitan and a very variable species. Of the features of this species, it is treated already in many publications. Resembling *B. rivulare*, but differing in the following points: Inflorescence autoicous; leaves usually acutely acuminate, somewhat divergent both in wet and dry conditions, more or less decurrent, margins finely denticulate all around.

Specim. exam.: **Hokkaidō.** Is. Rishiri: Yamunai valley *Hatt.* 22026. Prov. Abashiri: Abashiri *Nog.* 12600, Edasachi *H.O.* 1376. Prov. Kamikawa: Furano-machi *Ando* 3116, Mt. Daisetsu *Ando* 2910. **Honshū.** Pref. Akita: Kitaakita-gun *Mizs.* 4841. Pref. Toyama: Kurobe valley *Tak.* 14665. Pref. Nagano: Kirigamine *Tak.* 8816, Mt. Karamatsu *Tak.* 10280, Harinoki pass 2600 m *Tak.* 10448, Mt. Senjō *Tak.* 10035. Pref. Aichi: Mt. Mikuni *Tak.* 13629, Mt. Ryūzu *Tak.* 7649. Pref. Mie: Mt. Fujiwara *Tak.* 13525. Pref. Kyōto: Kibune *Toy.* 544. Pref. Ōsaka: Mt. Inunaki *Nak.* 366. **Shikoku.** Pref. Ehime: Nii-gun *K.O.* 695. **Kyūshū.** Pref. Fukuoka: Sawara-gun *Nog.* 34060. Pref. Kumamoto: Mt. Ichibusa *Mayeb.* 510, Kōnose *Mayeb.* 1263. **Formosa.** Prov. Tainan: Mt. Arisan *Nog.* 14668.

Fig. 18.

1-14. *Brachythecium rivulare* Bryol. Eur. (1-12: *Nak.* 1902; 13-14: orig. specim. of *B. laticuspis*)

15-23. *B. rutabulum* (L.) Bryol. Eur. (*Tak.* 16293)

1, 2. Stem leaves (×15). 3. Branch leaf (×15). 4. Median cells of stem leaf (×155). 5. Basal angle of stem leaf (×74). 6. Perichaetium (×12). 7, 8, 9, 10. Perichaetial bracts (×15). 11, 12. Capsules (×9). 13. Stem leaf (×24). 14. Branch leaf (×24). 15, 16. Stem leaves (×15). 17, 18. Branch leaves (×15). 19. Median cells of stem leaf (×155). 20. Basal angle of stem leaf (×74). 21, 22. Capsules (×9). 23. Calyptra (×9).

Range: Europe, Algeria, Caucasus, Syria, Persia, Himalaya, Siberia, North America, Ecuador, Bolivia, Tasmania, Fiji, Japan (Hokkaidō, Honshū, Shikoku, Kyūshū), and Formosa.

22. *Brachythecium calliergonoides* Broth. (Fig. 19)

Brachythecium calliergonoides Broth. ex Ihsiba in Bot. Mag. Tokyo, 49: 601 (1935); Sakurai, l.c. 189 (1954).

Robust, in wide glossy yellowish green mate. Stems 3–4 cm or more long, creeping, somewhat radiculose, irregularly branching. Branches ascending, 1.5–2.0 cm long, unequal, loosely and divergently foliate even in a dry condition. Leaves large, cordate-ovate, acuminate, somewhat concave, widely decurrent, faintly plicate; margins entire or slightly and partially denticulate; costa stout at base, but rapidly weakens upwards, extending $1/2$ – $2/3$ length of leaf. Leaf cells acutely linear-rhomboid, sometimes slightly vermicular, usually 10–15 times as long as broad, towards base gradually becoming shorter and wider, at decurrent angles large, pellucid. Seta strongly papillose, robust, about 19 mm long. Vaginula with numerous paraphyses. Capsules rather shorter and turgid. Dioicous.

Specim. exam.: **Honshū**. Pref. Aomori: Mt. Hakkōda *Mizs.* 4602. Pref. Miyagi: Mt. Taihaku *Ihsiba* (orig. specim.). Pref. Tōkyō: Minamitama-gun *Mizs.* 7624.

Range: Japan (Honshū).

It shows the characters both of *B. rivulare* and *rutabulum* in its leaf form. Namely, in having the long acumen it resembles *rutabulum*, but in its strongly decurrent leaf base it agrees with *rivulare*. However, its leaves are larger and more distantly foliate than in both, and usually bear numerous paraphyses exceeding the perichaetium. No operculum and calyptra are found in the original specimen.

Sect. *Reflexa* Limpr. Laubm. 3: 62 (1895)

Stems intricate and prostrate. Stem leaves broadly cordate-triangular, abruptly taper into a long, spreading acumen, decurrent, not plicate, areolation usually short, at angles quadrate-round and numerous. Seta rough throughout. Capsules small, oval-oblong, curved. Operculum small, apiculate.

Up to the present, the following species have been recorded in the present areas; *B. glaciale*, *reflexum*, *curtum*, *starkei*, *brotheri* and *scaberrimum*. But in the present revision 5 species and 1 variety are recognized.

Key to the species

- | | | | |
|---|---|--|---|
| 1 | { | Costa nearly reaching the apex..... | 2 |
| | | Costa reaching $1/2$ – $2/3$ length of leaf..... | 3 |

Fig. 19.

1–10. *Brachythecium calliergonoides* Broth. (orig. specim.)

11–18. *B. pendulum* Takaki

1, 2. Stem leaves ($\times 16$). 3. Branch leaf ($\times 16$). 4. Basal angle of stem leaf ($\times 74$). 5. Median cells of stem leaf ($\times 155$). 6. Perichaetium ($\times 12$). 7, 8, 9. Perichaetial bracts ($\times 16$). 10. Capsule ($\times 12$). 11. Plant ($\times 1$). 12. Stem leaf ($\times 19$). 13, 14, 15. Branch leaves ($\times 24$). 16. Basal angle of stem leaf ($\times 155$). 17. Median cells of stem leaf ($\times 155$). 18. Marginal part of stem leaf ($\times 155$).

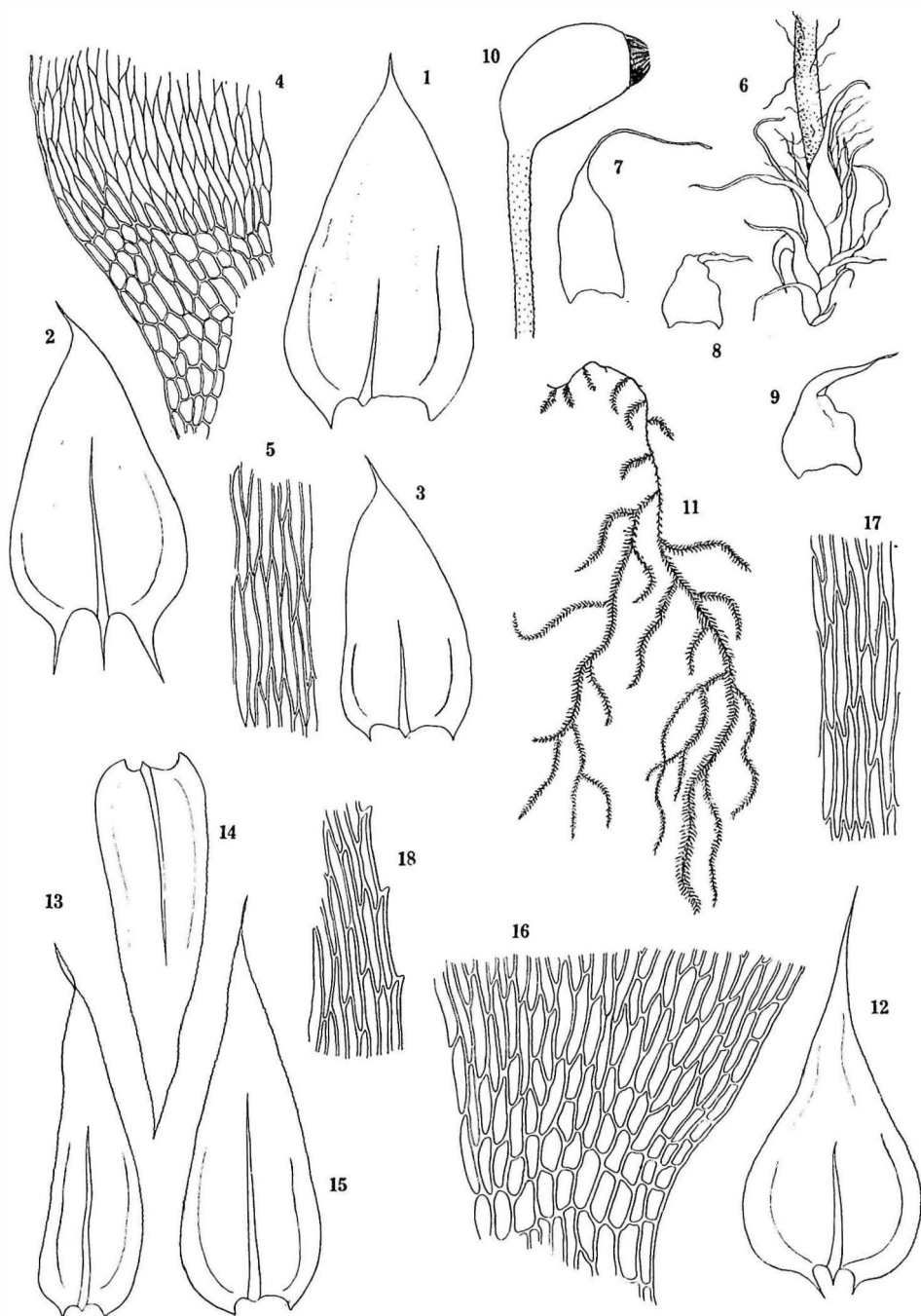


Fig. 19.

- 2 { Leaves larger, strongly falcate-secund.....*B. uncinifolium*
 { Leaves smaller, less falcate-secund.....*B. reflexum*
- 3 { Foliation spreading or divergent, not closely imbricate4
 { Foliation closely imbricated, not spreading; branches julaceous, obtuse.....*B. glaciale*
- 4 { Foliation dense, squarrose, not complanate*B. brotheri*
 { Foliation loose, complanate.....*B. starkei*

23. *Brachythecium uncinifolium* Broth. et Par. (Fig. 20)

Brachythecium uncinifolium Broth. et Par. in Rev. Bryol. **31**: 64 (1904).

Bryhnia uncinifolia (Broth. et Par.) Broth. in Engler, Pfl.-fam. **11**: 367 (1925); Sakurai l.c. 139, pl. 52-e (1954).

Plants in wide, soft, loosely intricate tufts, light green to brownish green, often glossy. Primary stems elongate, slender, creeping. Secondary stems suberect, ca. 7-10 mm long. Foliation strongly falcate-secund. Leaves broadly cordate-ovate, abruptly narrowed to a very long slender apex which is strongly reflexed, 1.4×0.85 mm, very concave, not plicate, decurrent, with margins finely denticulate all round. Costa stout, 57μ wide at base, sometimes shortly branched, vanishing below the apex. Median leaf-cells $40 \times 5 \mu$, oblong-hexagonal to oblong-rhomboidal, somewhat thickened at upper ends of walls, quadrate basal cells very numerous, extending entirely across the base in several rows, rather larger and rounded near the base of costa. Branch leaves lanceolate to ovate-lanceolate, gradually acuminate, margins serrate all around, more sharp near the apex. Capsules small oblong-cylindric or oblong-ovoid, asymmetric, inclined, $1.5-1.7 \times 1$ mm. Seta slender, 15-17 mm long, more or less roughened with rather low distant papillae. Autoicous.

Specim. exam.: **Hokkaidō**. Is. Rishiri: *Hatt.* 21851, 21829, 21937, 22041, 22047. Prov. Kamikawa: Mt. Daisetsu *Iwaz. & Tak.* 15615, *Nog.* 27056, 27819. Prov. Ishikari: Sapporo *Nog.* 1227. **Honshū**. Pref. Aomori: Oirase *Mizs.* 4733, *U.F.* 1464 (orig. specim.). Pref. Yamagata: Mt. Gassan *Igura* 370. Pref. Miyagi: Mt. Gozendake *Nog.* 1242. Pref. Ishikawa: Mt. Hakusan *Tak.* 9343, 10145, 9351. Pref. Nagano: Northern Alps, Harinoki pass *Tak.* 10456, Mt. Shirouma *Tak.* 9686, Mt. Kisokoma *Tak.* 3812, Southern Alps, Kitazawa-goya 2000 m *Tak.* 14214, 14240, Mt. Kitadake 2000 m *Tak.* 14329, Mt. Senjō *Tak.* 10024.

Range: Japan (Alpine and subalpine region in Hokkaidō and northern half of Honshū.)

At first this species was described as a member of *Brachythecium*, but was transferred afterwards to the *Bryhnia*. An examination of the original specimen has revealed that it much resembles *B. reflexum*. It is hardly conceivable that these two species belong to different genera. So the author cites the first combination by Broth. & Par. as mentioned above. This species is distinguishable from *B. reflexum* by the strongly falcate foliation, numerous quadrate basal cells of stem leaves, and stout costa.

24. *Brachythecium reflexum* (Starke) Bryol. Eur. (Fig. 20)

Brachythecium reflexum (Starke) Bryol. Eur. fasc. 52-54, pl. 539 (1853); Broth. l.c. 363 (1925); Sakurai, l.c. 137, pl. 54-h (1954).

Hypnum reflexum Starke in Web. & Mohr. Bot. Taschenb. 306, 476 (1807); Lindb. in Act. Soc. Sci. Fenn. **10**: 251, 275 (1872).

Brachythecium scaberrimum Card. in Bull. Soc. Bot. ser. 2, **3**: no. 7 (1911); Sakurai, l.c. 137 (1954). Syn. nov.

It forms loosely intricate, yellowish green, low patches. Stems slender, creeping, flexuose, reaching 10 cm long, radiculose, somewhat pinnately branched. Branches short, 1-1.5 cm, ascending or curved, slender often filiform. Stem leaves, ovate or broadly oblong, gradually tapering to a long, fine, reflexed acumen, ca. $1 \times 0.5-0.6$ mm, not or finely plicate, margins finely denticulate all around, decurrent; costa reaching or short of the apex; median leaf-cells narrowly rhomboid, $23-28 \times 5-7 \mu$, with firm and rather incrassate walls, gradually becoming shorter and wider towards base, at angles large, quadrate-round as is shown in Fig. 20. Branch leaves narrower, lanceolate, gradually tapering to a fine, elongated acumen, hardly plicate, shortly decurrent; median leaf-cells somewhat narrower than in the stem leaves; margins more denticulate. Seta rough, delicate, 16-17 mm long, about 0.17 mm thick. Capsules very small, oval-oblong, curved, inclined or horizontal. Operculum small, apiculate. Autoicous.

Specim. exam.: **Hokkaidō**. Is. Rishiri: Ohanabatake *Hatt.* 21826, 21859. Rrov. Kamikawa: Mt. Daisetsu *Iwaz. & Tak.* 15500, 15575, 15588, 15594, Ando 2955. **Honshū**. Pref. Aomori: Osoreyama *Nog.* 21088. Pref. Yamagata: Higashimurayama-gun *Igura* 215, Mt. Gas-san *Igura* 367. Pref. Gumma: Oze *Mizs.* 1418. Pref. Nagano: Mt. Karamatsu 2350 m *Tak.* 10290, Harinoki pass *Tak.* 10448, Mt. Shirouma *Tak.* 228, 6949, 9619, Mt. Noguchigorō *Tak.* 12454, Mt. Kisokoma *Tak.* 1578, Mt. Senjō 2600 m *Tak.* 10049, do. 2300 m *Tak.* 9936, Mt. Kisoontake 2850 m *Tak.* 13957, do. 2500 m *Tak.* 14022. Pref. Gifu: Hiranoyu *U.F.* 3613 (orig. specim. of *B. scaberrimum*).

Range: Europe, North America, Caucasus, Kashmir, Siberia, Amur, Sakhalin, and Japan (Hokkaidō, Honshū).

Hab.: On humus under shrubs in alpine or subalpine region.

The above description is based on our materials which well agree with the European and North American materials in their characters. The species *B. scaberrimum* was described as having a densely mamillate seta, but this character passes into the typical form of *B. reflexum* by degrees. Both species seem to be conspecific.

24 a) var. *filirameum* (Besch.) Card.

Brachythecium reflexum var. *filirameum* (Besch.) Card. in Bull. Soc. Bot. Gen. ser. 2, 3: no. 7 (1911); Sakurai, l.c. 137 (1954).

Brachythecium filirameum Besch. in litt.?

A very delicate filamentous plant. Stems slender, 3 cm long, filiform at the tip, sparingly branching. Branches also slender, 4-5 mm. Seta delicate about 7-10 mm, very rough throughout. Capsules very small.

Specim. exam.: **Hokkaidō**. Prov. Hidaka: Mombetsu *U.F.* 14601 (orig. specim.).

Range: Japan (Hokkaidō).

25. *Brachythecium brotheri* Paris (Fig. 21)

Brachythecium brotheri Paris, Ind. ed. 2, 1: 139 (1904); Reimers & Sakurai in Bot. Jahrb. 64: 551 (1931); Broth. l.c. 364 (1925); Dixon in Rev. Bryol. 4: 159 (1931); Sakurai, l.c. 136, pl. 54-m (1954).

Brachythecium Starkei (Brid.) Sch. var. *nipponense* Besch. in Ann. Sci. Nat. ser. 7, 17: 376 (1893). Syn. nov.

Hypnum flexicaule Broth. in Hedw. 38: 240 (1899).

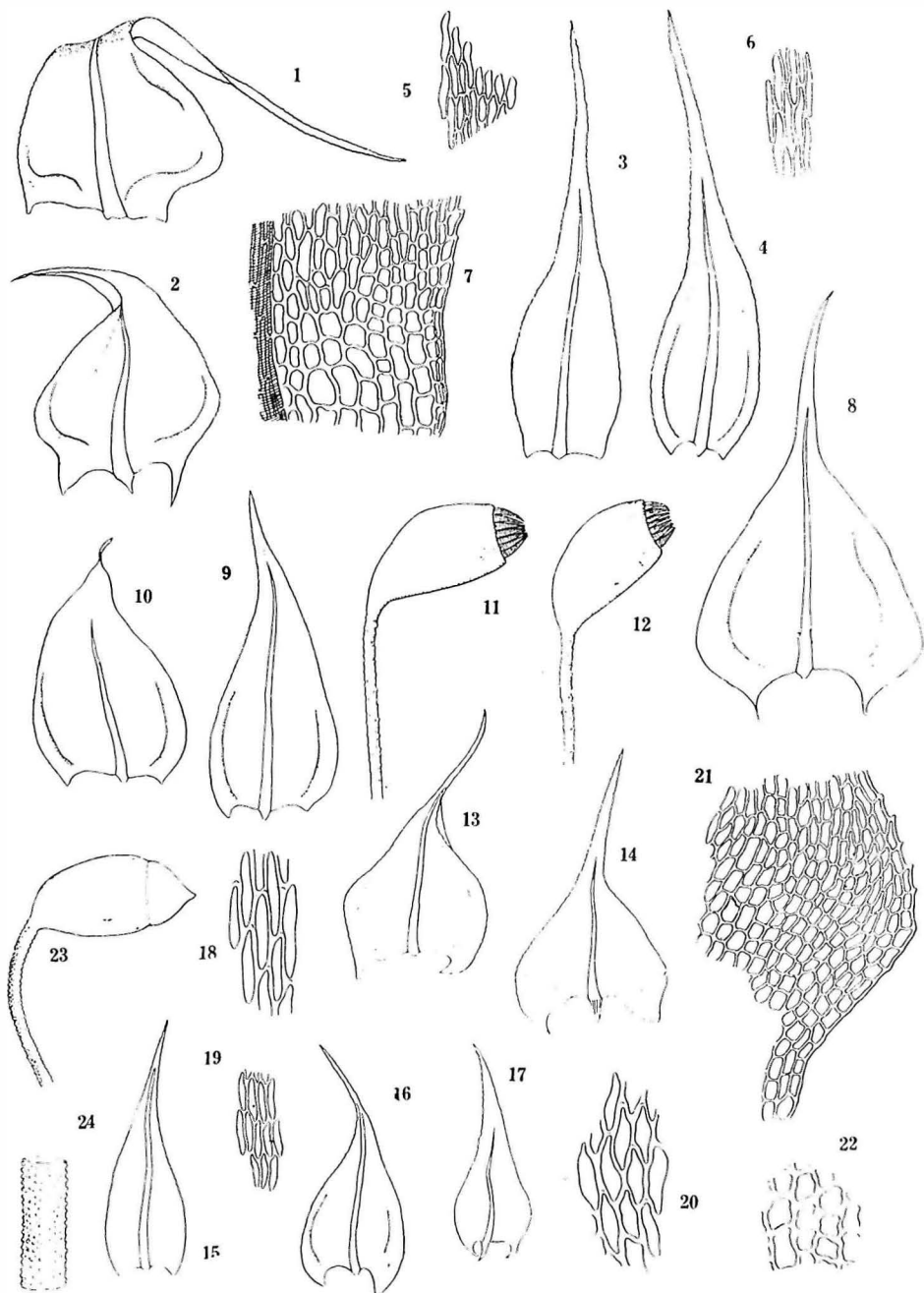


Fig. 20.

Brachythecium flexicaule Par. Suppl. Ind. 44 (1900); Sakurai, l.c. 137 (1954).

This is the robustest species of this section. It forms loosely intricate, yellowish-green, somewhat glossy tufts. Stems prostrate, flexuose, densely radiculose, subpinately and distantly branching, reaching 5 cm or more long. Branches flexuose, attenuate, about 3 cm long. Foliation squarrose. Leaves rather distant, spread-open, sometimes reflexed. Stem leaves broadly cordate-ovate, suddenly tapering into a long acumen, less concave, little or not plicate, scarcely decurrent, margins minutely serrulate all around. Costa $1/2$ length of leaf, thin. Median leaf-cells linear-fusiform, varying in length, usually ca. $60-90 \times 9 \mu$, occasionally attaining a length of 120μ , thin-walled, basal and alar cells much enlarged, loosely areolate, oblong-rhomboidal, extreme alar cells somewhat quadrate. Branch leaves broadly lanceolate and more gradually taper to acumen and more closely denticulate all around. Median leaf cells as in stem leaves in size, but sometimes more longly fusiform. Seta attains a length of 1-2.2 cm, reddish brown, flexuose when dry, very rough throughout. Capsules oblong-cylindric, reaching $1.7-2.0 \times 1.0$ mm, inclined or horizontal. Operculum apiculate, about 0.6 mm long. Autoicous or dioicous.

Specim. exam.: **Hokkaidō**. Is. Rebun: Hatt. 21746. Is. Rishiri: 100 m Iwaz. & Tak. 15152, 15178, 15409, Hatt. 21929, 21930, 21942, 21943, Oshidomari 300-400 m Iwaz. & Tak. 15244, 15448. Prov. Kamikawa: Nishishibetsu Nog. 20966, Mt. Daisetsu Nog. 19583, Ando 2953. Prov. Sorachi: Mt. Yūbari Tcy. Prov. Abashiri: Abashiri Nog. 12606. Prov. Kushiro: Mt. Meakan Nog. 28080, 28082. Prov. Ishikari: Mt. Karanuma Nog. 24028. **Honshū**. Pref. Aomori: Yagen Nog. 21114, Tanabe Nog. 21044, 21139, Kominato U.F. 26 (orig. specim. of *B. starkei* var. *nipponense*). Pref. Akita: Arakawa-mura Nog. 15995, Kitaakita-gun Nog. 15856, 15957, Yamamoto-gun Nog. 15850. Pref. Yamagata: Mt. Atsumi Nog. 16336, Mt. Chōkai Asano 106, Mt. Zaō Ikeg. 9061. Pref. Fukushima: Oze Mizs. 4922. Pref. Gumma: Mt. Tanigawa Mizs. 2021, Tone-gun Ikeg. 32520, Oze Mizs. 5151. Pref. Niigata: Mt. Myōkō Yano 966, Yabukami-mura Yano 417, Tsubame-onsen Yano 918, Kitaonuma-gun Ikeg. 11650, Minamiuonuma-gun Ikeg. 16007, Kitakambara-gun Ikeg. 10956, Nakakambara-gun Ikeg. 17390, Minamikambara-gun Ikeg. 10732, Higashikambara-gun Ikeg. 8113, Nakakubiki-gun Ikeg. 10031, Nishikubiki-gun Ikeg. 11253, Kamo-shi Ikeg. 30287, Iwafune-gun Ikeg. 10187, Is. Sado Ikeg. 20234. Pref. Toyama: Kurobe valley Tak. 14648, 14654, 14735, 14706. Pref. Nagano: Mt. Shirouma Tak. 309, 6884, 6912, 7098, 9492, Mt. Eboshi Tak. 12352, 12339, Harinoki pass Tak. 10479, Mt. Kisokoma Tak. 7265, Mt. Kisoontake Tak. 13853, Mt. Togakushi 1200 m Tak. 12201, do. 1900 m Tak. 12261, Mt. Akaishi 2600 m Tak. 6748. Pref. Ishikawa: Mt. Hakusan Tak. 9305. Pref. Gifu: Shirakawa-mura Tak. 9254. Pref. Kyōto: Mt. Ashiu Tcy., Mt. Hiei Nak. 4637, Kitakuwata-gun Mizt. 385. Pref. Ōsaka: Mt. Kongō Nak. 2295. Pref. Nara: Mt. Ōdaigahara Mizt. 689. Pref. Tottori: Mt. Daisen Nog. 2479. **Shikoku**. Pref. Ehime: Nii-gun Nog. 23765, K.O. 1891, Kamiukena-gun K.O. 3315.

Range: Japan (Hokkaidō, Honshū and Shikoku).

Fig. 20.

- 1-12. *Brachythecium uncinifolium* Broth. et Par. (1-7: orig. specim.; 8-12. Tak. 14240)
 13-14. *B. reflexum* (Starke) Bryol. Eur. (orig. specim. of *B. scaberrimum*)
 1. 2. Stem leaves ($\times 60$). 3. 4. Branch leaves ($\times 44$). 5. Median cells of stem leaf ($\times 217$). 6. Median cells of branch leaf ($\times 217$). 7. Basal angle of branch leaf ($\times 200$).
 8. Stem leaf ($\times 35$). 9. 10. Branch leaves ($\times 35$). 11. 12. Capsules ($\times 12$). 13. 14. Stem leaves ($\times 35$). 15. 16. 17. Branch leaves ($\times 35$). 18. Median cells of stem leaf ($\times 340$). 19. Ditto ($\times 155$). 20. Upper cells of stem leaf ($\times 340$). 21. Basal angle of stem leaf ($\times 155$). 22. Alar cells of stem leaf ($\times 340$).

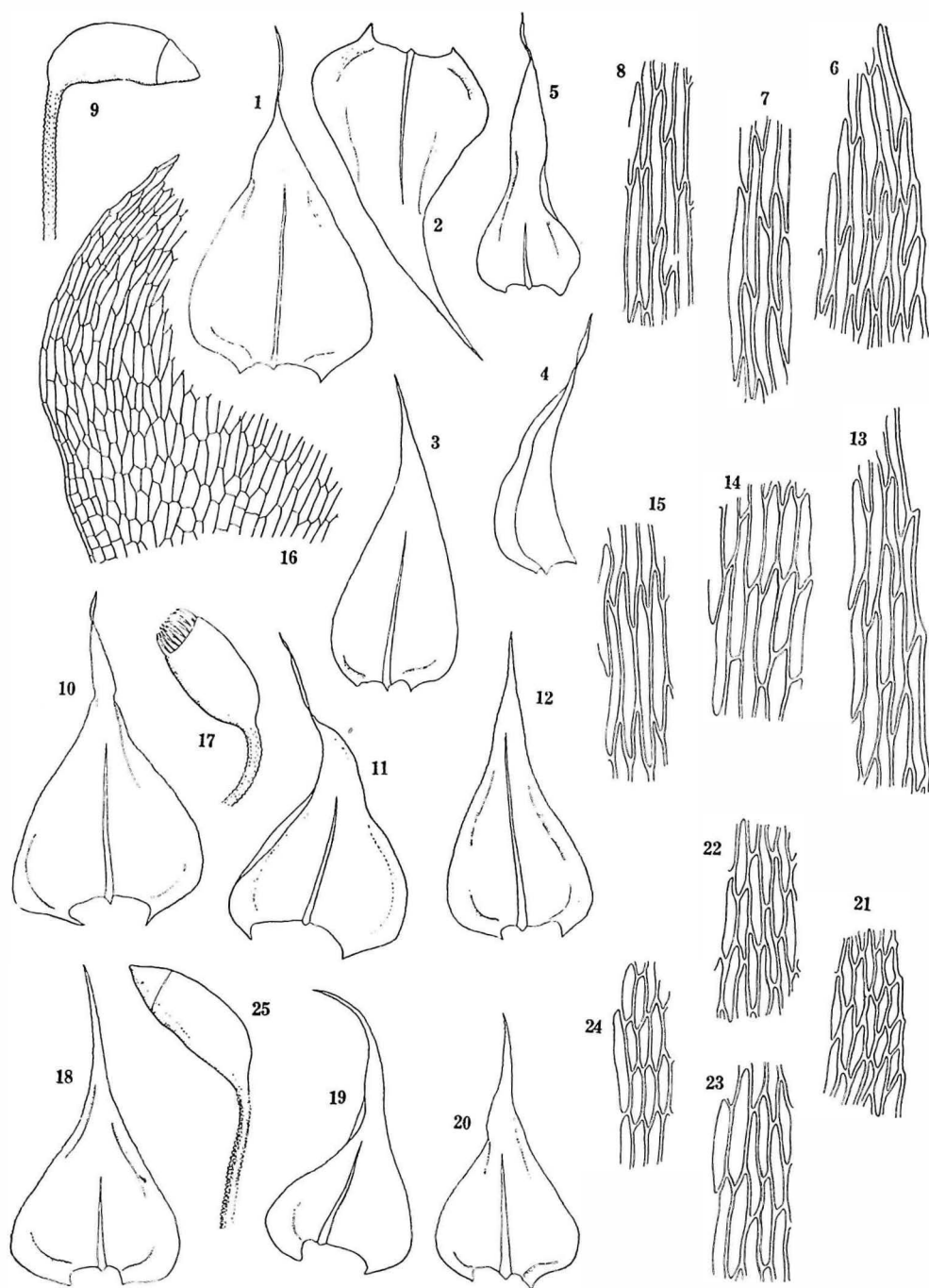


Fig. 21.

This is an endemic and distinct species. It is known that this species has two conspicuous forms, small and large in size, and they have been examined cytologically by K. Yano⁴. He stated that the small form is haploid and monoicous in gametophyte, whereas the large form is diploid and dioicous in gametophyte. These two forms are very conspicuous in their extreme state, but many intermediate forms are also seen when we examined a lot of specimens. On the taxonomical separation of these two forms it is deferred to future decision.

By the examination of the original specimen of *B. starkei* var. *nipponense* the author observed it agrees well with the large form of *B. brotheri*.

26. *Brachythecium starkei* (Brid.) Bryol. Eur. (Fig. 22)

Brachythecium starkei (Brid.) Bryol. Eur. fasc. 52-54, pl. 541 (1853); Broth. in Engler, Pfl.-fam. 11: 364 (1925); Sakurai, l.c. 137 (1954).

Hypnum Starkei Brid. Musc. Rec. 2: 107 (1801); Lindb. in Act. Sci. Fenn. 10: 275 (1872).

Hypnum curtum Lindb. Musc. Scand. 35 (1879).

Brachythecium curtum (Lindb.) Lindb. in Medd. Af. Soc. Pr. F. et Fl. Fenn. 5 (1879); Broth. l.c. 363 (1925); Sakurai, l.c. 137, pl. 54-i (1954).

Plants robust, but smaller than *B. brotheri*. It forms wide, pale green, loose tufts. Stems irregularly divided, pinnately branching, branches often stroniferous at ends, more or less complanately foliate. Stem leaves as in *B. brotheri*, widely cordate-ovate, rapidly narrowing to a carinate, falcate long acumen, $2.4 \times 1-1.2$ mm, little or not at all plicate, margins finely denticulate all around, costa extending $3/5$ length of leaf, sometimes partly undulate. Median leaf-cells about $80 \times 11 \mu$, fusiform-hexagonal, basal and alar cells loosely areolate, oblong-rhomboidal, extreme alar cells somewhat quadrate. Branch leaves more slenderly acuminate, margins more strongly denticulate, costa sometimes reaching below the apex, more loosely areolate at base. Seta 1.7-2.0 cm long, robust, strongly papillose. Perichaetium 3 mm long, the inner leaves oblong-lanceolate, rather abruptly narrowed into a strongly reflexed points, margins nearly entire, very loosely areolate, ecostate. Capsules oblong-ovoid, usually strongly arcuate, 1.5-2.0 mm long, about 1 mm thick.

Specim. exam.: **Hokkaidō**. ls. Rishiri: Mt. Rishiri *Iwaz. & Tak. 15334*. Prov. Kitami: Shiriusu *Takeuchi*. **Honshū**. Pref. Nagano: Kirigamine, Kannonzawa *Tak. 8819*.

Range: Europe, North America, Caucasus, Siberia, Amur and Japan (Hokkaidō, Honshū).

It resembles *B. brotheri* in many respects, but differs in having branches with somewhat complanate and distant foliation. Grout pointed out in his "Moss Flora of North America" that the American *starkei* is usually somewhat complanate in

Fig. 21. *Brachythecium brotheri* Paris (1-9: orig. specim. of *B. starkei* var. *nipponense*; 10-17: Yano 966—large form; 18-25: Yano 918—small form)

1, 2, 10, 11, 18, 19. Stem leaves ($\times 19$). 3, 4, 5, 12, 20. Branch leaves ($\times 19$). 6, 13, 21. Marginal parts of stem leaves ($\times 218$). 7, 14, 22, 23. Median cells of stem leaves ($\times 218$). 8, 15, 24. Median cells of branch leaves ($\times 218$). 9, 17, 25. Capsules ($\times 9$). 16. Basal angle of stem leaf ($\times 93$).

4) Yano, K.: On the Chromosomes in Some Mosses VI. in Bot. Mag. Tokyo, 67: 129 (1954).

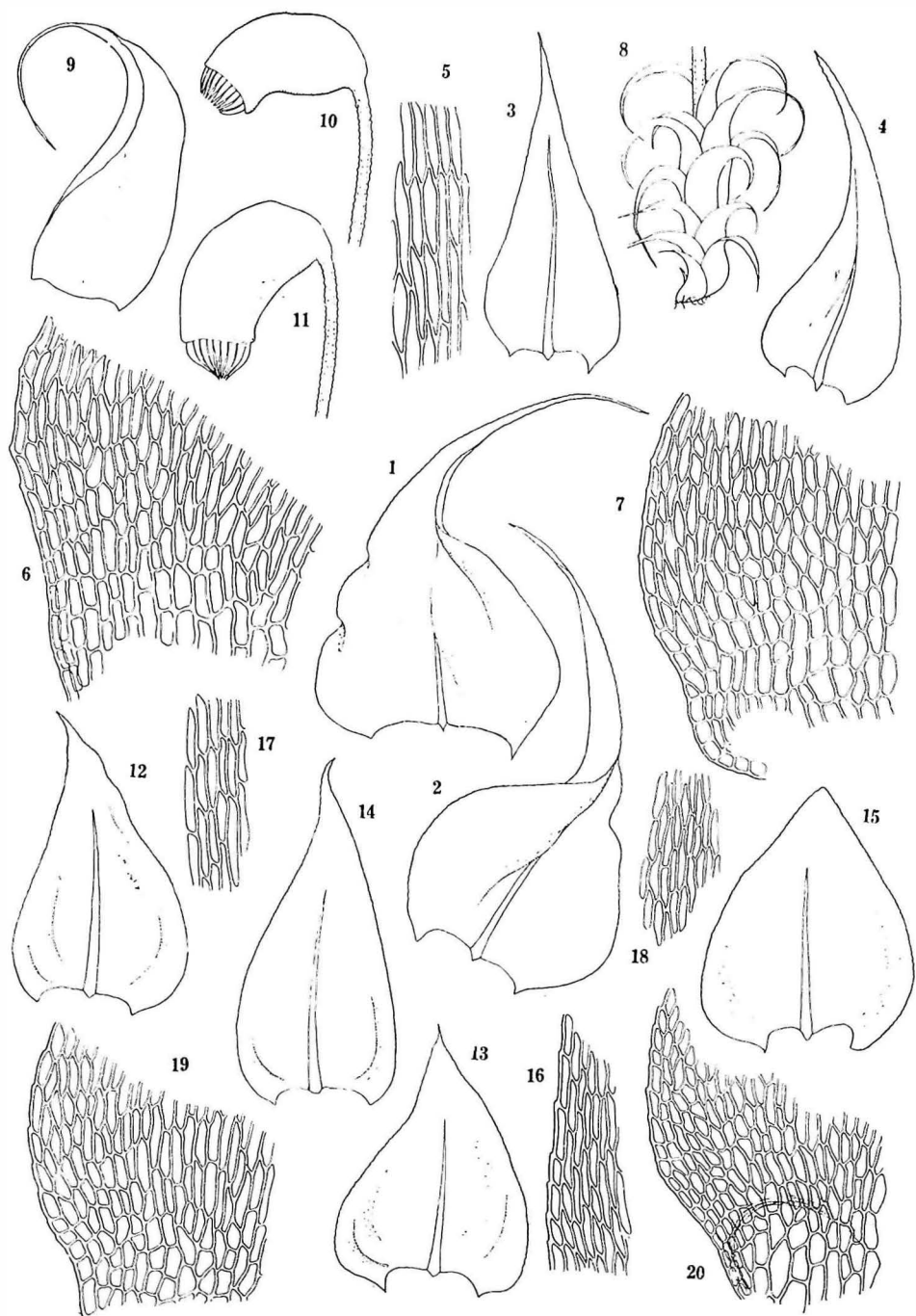


Fig. 22.

foliation than in the European materials. Regarding this feature, the Japanese materials agree well with the American form.

27. *Brachythecium glaciale* Bryol. Eur. (Fig. 22)

Brachythecium glaciale Bryol. Eur. fasc. 52-54, pl. 542 (1853); Broth. l.c. 363 (1925); Sakurai in Bot. Mag. Tokyo, 56: 222 (1942); Musc. Jap. 137, pl. 54-1 (1954).

The most striking characters of this species seem to be the following points, as is described by Dixon in his "Student's Handbook of British mosses." Branches obtuse and julaceous. Leaves closely imbricate, not spreading or distant, widely ovate-lanceolate. Cilia of inner peristome nodulose, rarely appendiculate.

The Japanese specimen examined by the author is unfortunately sterile, but the characters of gametophyte agree with those of the European specimen. The leaves vary greatly even in the same plant as is shown in Fig. 22. Stem leaves ovate-triangular, tapering in short acumen, 1.1-1.3 mm long, 0.65-0.7 mm wide. Branch leaves broader and sometimes obtuse in apex, very concave, leaf-cells sometimes distinctly differentiated at the alar part.

Specim. exam.: **Hokkaidō**. Prov. Kamikawa: Mt. Daisetsu, alpine region *Iwaz.* & *Tak.* 15568.

Range: Europe (Pen. Kola, Lappland, Norway, Scotland, Pyrenees, etc.) Tibet, North America and Japan (Hokkaidō, Honshū).

Sect. *Velutina* Broth. in Engler, Pfl.-fam. I, 3: 1145 (1909)

Brotherus established two sections, *Velutina* and *Julacea*, under the subgen. *Velutimum* Loesk. Under the section *Velutina*, the following species are recorded from the present area; *B. pulchellum*, *minutum*, *rhynchostegielloides*, *uematsui* and *velutinum*. Under the sect. *Julacea*, in the same way; *B. collinum* var. *sapporensis*, *laticuspis*, *pallens* and *sakuraii*. In comparing these species with each other, we can observe that the distinction between the two sections is very slight. The author therefore has decided to separate these two sections by the smoothness of the seta, as is shown in the key of sections. Among them, *B. velutinum* is the only species which clearly belongs to the sect. *Velutina*, and some of the rest seem to belong to the sect. *Julacea*. Both sections agree with each other in the following points. Plants soft, delicate and small in size. Leaves scarcely or not plicate, narrowly lanceolate, gradually tapering to a very long, slender acumen, not decurrent; costa faint, to the middle or beyond; margins denticulate all around; alar cells quadrate to subquadrate. Capsules inclined or horizontal, ovoid to ovoid-cylindric, small.

Fig. 22.

1-11. *Brachythecium starkei* (Brid.) Bryol. Eur. (*Tak.* 8819).

12-20. *B. glaciale* Bryol. Eur. (*Tak.* 15568).

1, 2. Stem leaves ($\times 30$). 3, 4. Branch leaves ($\times 30$). 5. Median cells of stem leaf ($\times 155$). 6. Basal angle of stem leaf ($\times 134$). 7. Median cells of branch leaf ($\times 155$). 8. Perichaetium ($\times 12$). 9. Perichaetial bract ($\times 19$). 10, 11. Capsules ($\times 12$). 12, 13, 14. Stem leaves ($\times 35$). 15. Branch leaf ($\times 35$). 16. Marginal cells of stem leaf ($\times 155$). 17. Median cells of do. ($\times 155$). 18. Median cells of branch leaf ($\times 155$). 19. Basal angle of stem leaf ($\times 155$). 20. Basal angle of branch leaf ($\times 155$).

28. *Brachythecium velutinum* (L.) Bryol. Eur. (Fig. 23)

Brachythecium velutinum (L.) Bryol. Eur. fasc. 52-53, pl. 538 (1853); Broth. in Engl. Pfl.-fam. **11**: 364 (1925); Sakurai in Bot. Mag. Tokyo, **46**: 742 (1932); Musc. Jap. 137, pl. 54-s (1954).

Hypnum velutinum L. Sp. Pl. 1129 (1753); Lindb. in Act. Soc. Sci. Fenn. **10**: 251 (1872).

Plants delicate, yellowish green, forming intricate, soft and low mats. Branches short, straight or curved, often somewhat falcate-secund at the ends of the branches. Leaves usually widely spreading when dry, lanceolate, gradually narrowing towards apex, finely or coarsely serrulate all around, shortly decurrent, costa beyond the middle, toothed above on the back, median leaf-cells narrow-linear, $65-70 \times 6-8 \mu$, alar cells irregularly quadrate. Seta rough throughout, short ca. 10 mm long. Capsules ovoid, small, 1.5×1.0 mm. Operculum conic. Autoicous.

Specim. exam.: **Hokkaidō**. Is. Rebun: Kabuka *Iwaz. & Tak. 15097*. Is. Rishiri: *Hatt. 21935, 21939*. **Honshū**. Pref. Nagano: Mt. Shirouma *Tak. 229*.

Range: Europe, Morocco, Algier, Caucasus, Persia, Kashmir, North America, Sakhalin and Japan (Hokkaidō and subalpine regions of the northern half of Honshū).

Sect. *Julacea* Broth. in Engler, Pfl.-fam. I, **3**: 1146 (1909)

Key to the species

- | | | | |
|---|---|---|--------------------------------|
| 1 | { | Seta smooth throughout..... | 2 |
| | { | Seta often rough above, having low blunt papillae..... | 6 |
| | | Stem leaves narrowly lanceolate with long slender acumen, sometimes falcate-secund; | |
| 2 | { | golden glossy..... | 3 |
| | { | Stem leaves oblong-lanceolate with comparatively short acumen, not falcate-secund; | |
| | { | slightly or not glossy..... | 4 |
| 3 | { | Stem leaves narrowly oblong-lanceolate; leaf cells very narrow..... | <i>B. pulchellum</i> |
| | { | Stem leaves narrowly deltoid-lanceolate; leaf cells rhomboidal..... | <i>B. noguchii</i> |
| 4 | { | Stems flatly branching; branches creeping, spreading foliate..... | <i>B. pallescens</i> |
| | { | Branches erect or ascending, somewhat terete-foliate..... | 5 |
| 5 | { | Median leaf-cells oblong-rhomboidal..... | <i>B. sapporensis</i> |
| | { | Median leaf-cells linear-fusiform..... | <i>B. sakuraii</i> |
| 6 | { | Branch leaves narrowly lanceolate..... | <i>B. rhynchostegielloides</i> |
| | { | Branch leaves broadly ovate-lanceolate..... | <i>B. uematsui</i> |

29. *Brachythecium pulchellum* Broth. et Par. (Fig. 23)

Brachythecium pulchellum Broth. et Par. in Rev. Bryol. **31**: 63 (1904); Broth. l.c. 364 (1925); Sakurai, l.c. 137 (1954).

Plants very delicate, forming dense golden glossy and low (ca. 4-5 mm high) mats. Stems creeping, sending up numerous erect branches. Branches subjulaceous, straight or somewhat curved. Stem leaves ovate-lanceolate to narrowly lanceolate, usually falcate-secund, tapering to a long acumen, ca. 1.8×0.4 mm, very concave and plicate; margins nearly entire or minutely serrulate above; costa thin, often inconspicuous, $1/3-1/2$ length of leaf, often forked at the end; median leaf-cells linear-fusiform, $67-74 \times 6-6.5 \mu$, towards margin somewhat shorter, basal cells shorter and broader, alar cells well differentiated, forming a cluster of much inflated

quadrate cells in 5–6 rows next to the margin. Branch leaves similar to stem leaves in form, but are more dentate on the margin and less concave. Seta ca. 10 mm, delicate, smooth. Capsules brown, shortly oblong, arcuate, asymmetric.

Specim. exam.: **Honshū**. Pref. Niigata: Mt. Myōkō *Nog.* 13173. Pref. Hiroshima: Kōnanson *Nog.* 12044. **Kyūshū**. Pref. Kumamoto: Mt. Ichibusa *U.F.* 1313 (orig. specim.).

Range: Japan (Honshū and Kyūshū).

30. *Brachythecium pallescens* Dix. et Thér. (Fig. 23)

Brachythecium pallescens Dix. et Thér. in Rev. Bryol. 4: 160 (1931); Sakurai, l.c. 137 (1954).

Plants small and slender, dirty green, forming low and intricate mats. Stems creeping, densely and pinnately branching. Branches short, creeping to ascending, 2–5 mm long, somewhat spreading foliate. Stem leaves cordate-ovate, rapidly narrowing to acumen, 1.3×0.55 mm, concave, irregularly somewhat plicate; margins nearly entire; costa $3/5$, stout at base; median leaf-cells $45 \times 8 \mu$, rhomboidal to fusiform, thin-walled, loosely areolated, basal cells larger, rectangular, alar cells quadrate. Branch leaves ovate-lanceolate, gradually tapering to acumen, 1.1×0.34 mm, concave; margins almost entire; median leaf-cells rhomboidal, $48 \times 9 \mu$.

Specim. exam.: **Honshū**. Pref. Tōkyō: Yose *Mizs.* 8658. Pref. Wakayama: Kushimoto *Sas.* 430 (orig. specim.).

Range: Japan (Honshū).

This original specimen is sterile and very poor in quantity, so we cannot obtain a sufficient knowledge of this species from it. It resembles *B. velutinum* or *B. buchanani* var. *gracillimum* in appearance, but differs from them in the areolation of leaf. Perhaps it may be a form of a certain species, but the author is unable at present to determine of what species it is a form, though he examined the original specimen.

31. *Brachythecium sapporensis* (Besch.) Takaki stat. nov. (Fig. 23)

Brachythecium collinum Schleich. var. *sapporensis* Besch. in Ann. Sci. Nat. ser. 7, 17: 373 (1893). Syn. nov.

A very delicate and soft plant. Stems creeping, sending up erect branches. Branches slender, soft, flexuose, 4–5 mm high. Lower branch-leaves ovate, shortly acute. Upper branch-leaves widely ovate-lanceolate, tapering to a short acumen, 0.7×0.25 mm, concave; margins minutely serrulate all around; costa wide, extending beyond the middle, abruptly ceasing at terminal; median leaf-cells oblong rhomboidal, $30 \times 7.3 \mu$, firmly walled, somewhat papillose by the projecting upper ends, basal areolation somewhat loose, alar cells quadrate, numerous. Seta nearly smooth, 7 mm long.

Specim. exam.: **Hokkaidō**. Prov. Ishikari: Sapporo *U.F.* 124 (orig. specim.).

Range: Japan (Hokkaidō).

Bescherelle described this as a variety of *B. collinum*. By the examination of the original specimen the author considers it is preferable to rank as a distinct species, regarding its broad costa and firmly walled oblong-rhomboidal leaf-cells as the distinguishing characters.

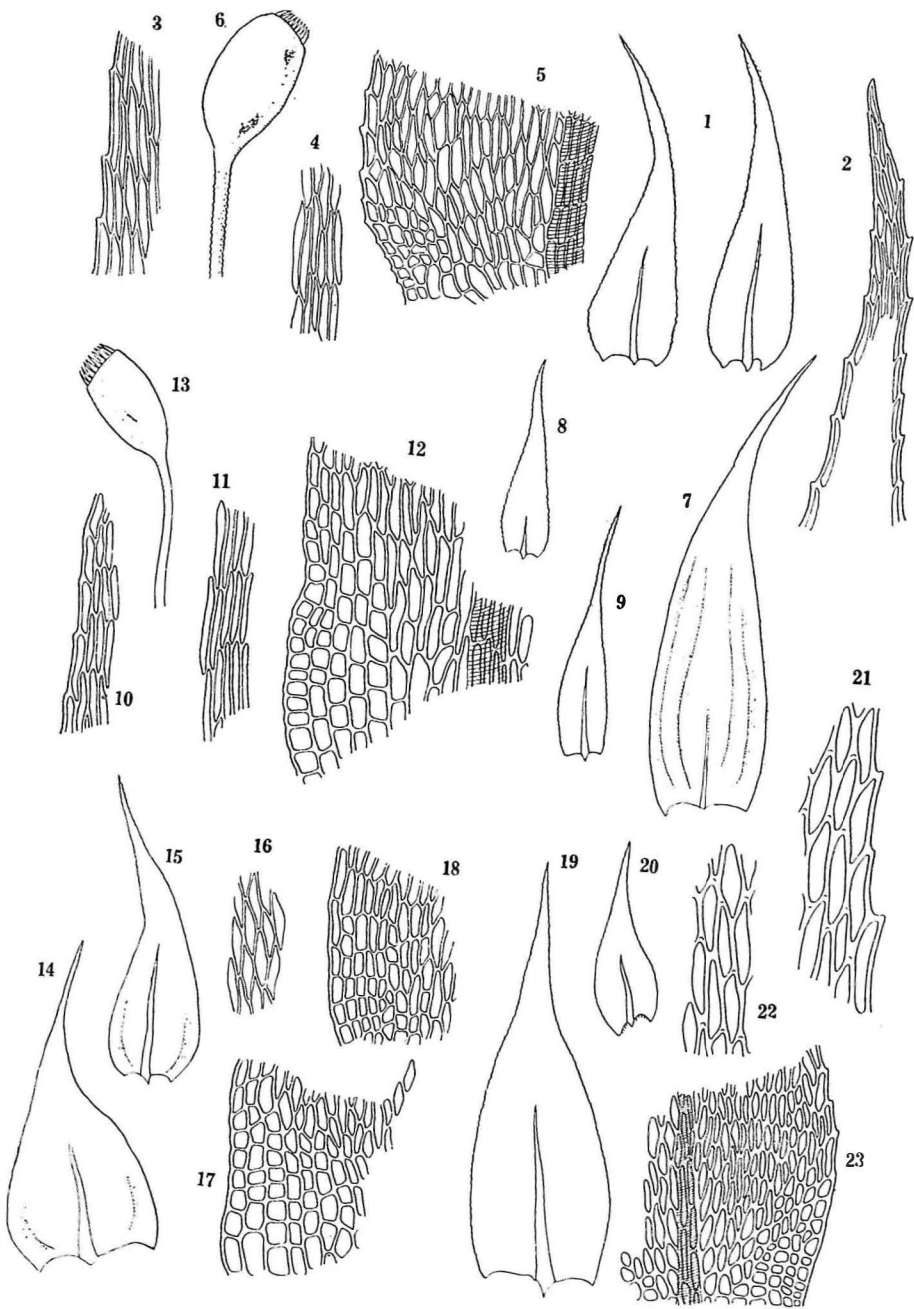


Fig. 23.

32. *Brachythecium noguchii* Takaki sp. nov. (Fig. 24)

Dioicum. Planta gracilis, mollissima, caespitosa, caespitibus densis, late extensis, aureis vel aureo-viridibus, subnitidis. Caulis procumbens, fusco-radiculosus, stoloniformiter prolongatus, irregulariter ramosus, ramis erectis vel decumbentibus, ca. 4–5 mm longis, dense foliosis. Folia sicca subadpressa, humida erecto-patentia. Folia caulina e basi cordato-ovata, sensim longe subulatum attenuata, breviter decurrentia, 1.7×0.65 mm; marginibus in toto minute serrulatis, e medio basin versus recurvis; nervo tenui, ad medium vel $2/3$ folii evanido, extremitate dorso denticulo instructo; cellulis laminarum anguste rhomboideis, in medio folii 42μ longis, 8μ latis, alaribus quadratis vel rotundatis. Folia ramea et ramulina 1.4×0.42 mm, e basi ovata sensim longissime lanceolatum attenuata. Bractee perichaetii internae anguste oblongae sensim in acumen elongatum piliferum attenuatae, ca. 2.5×0.5 mm; marginibus superioribus minutissime serrulatis; nervo indistincto. Seta ca. 15–18 mm longa, rubra, tenuis, laevis, apice arcuata. Theca obliqua vel horizontalis, ovato-oblonga, ca. 1.3–1.5 mm longa, 0.65–0.85 mm crassa. Annulus duplex, deciduus. Exostomii dentes lineari-lanceolati, ca. 0.48 mm longi et basi ca. 0.11 mm lati, inferne lutei transverse striatuli, superne hyalini, papilloso, hyaline limbati, intus dense lamellosi; endostomium luteum papillosum; corona basilaris ca. 0.24 mm alta; processus carinati in carina late perforati; cilia 2, bene evoluta, papillosa, nodulosa.

Specim. exam.: **Kyūshū**. Pref. Miyazaki: Mt. Osuzu *Tak.* 16290—Holotype, leg. Y. Kuwahara, Nov. 1950.

In appearance it resembles *B. pulchellum*, but is distinguishable by the taller habit, leaf form and alar areolation.

33. *Brachythecium sakuraii* Broth. (Fig. 24)

Brachythecium sakuraii Broth. in Ann. Bryol. 1: 24 (1928); Reimers & Sakurai in Bot. Jahrb. 64: 551 (1931); Dixon in Rev. Bryol. 4: 159 (1931); Sakurai, l.c. 137 (1954).

Plants very minute in size, delicate, soft, densely tufted, yellowish green above, dirty green below, closely applied to the substratum. Stems creeping and radiculose, subpinnately branching. Branches 5–7 mm, erect or ascending, curved, somewhat terete-foliate. Leaves broadly ovate, rather abruptly narrowing to an

Fig. 23.

1–6. *Brachythecium velutinum* (L.) Bryol. Eur. (*Tak.* 15097).

7–13. *B. pulchellum* Broth. et Par. (orig. specim.)

14–18. *B. pallescens* Dix. et Thér. (orig. specim.)

19–23. *B. sapporensis* (Besch.) Tak. (orig. specim.)

1. Leaves ($\times 35$). 2. Apical part of leaf ($\times 155$). 3. Marginal part of leaf ($\times 155$).
4. Median leaf cells ($\times 155$). 5. Basal angle of leaf ($\times 155$). 6. Capsule ($\times 12$). 7. Stem leaf ($\times 35$).
- 8, 9. Branch leaves ($\times 35$). 10. Marginal part of leaf ($\times 155$). 11. Median leaf cells ($\times 155$).
12. Basal angle of stem leaf ($\times 155$). 13. Capsule ($\times 12$).
14. Stem leaf ($\times 35$). 15. Branch leaf ($\times 35$). 16. Median cells of stem leaf ($\times 155$).
17. Basal angle of stem leaf ($\times 155$). 18. Basal angle of branch leaf ($\times 155$). 19. Branch leaf ($\times 74$).
20. Do. ($\times 35$). 21. Marginal part of stem leaf ($\times 340$). 22. Median cells of stem leaf ($\times 340$).
23. Basal part of stem leaf ($\times 155$).

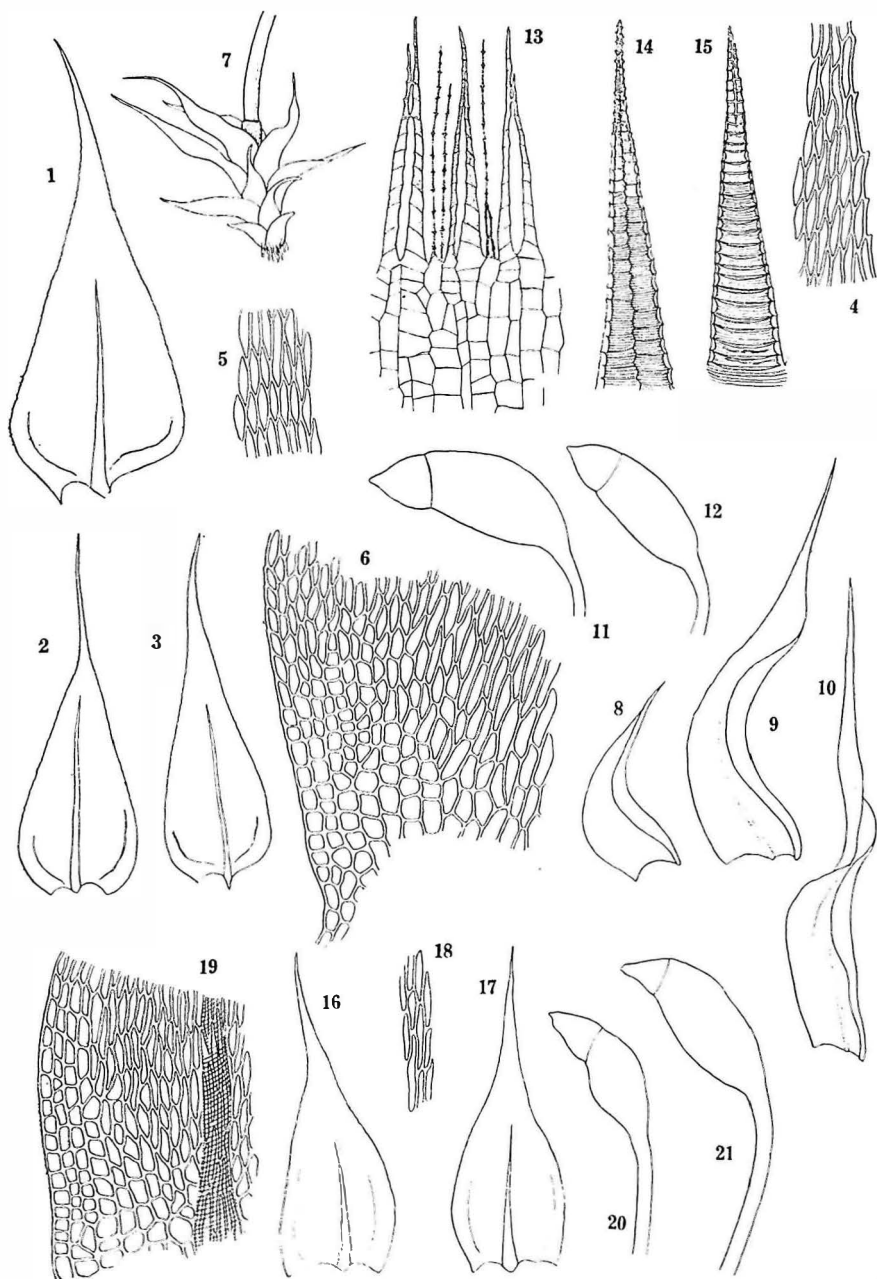


Fig. 24.

acumen, ca. 1×0.34 mm, more or less concave, not plicate, hardly decurrent; margins minutely and distantly serrulate all around; costa $2/3$ length of leaf, comparatively stout at base, rapidly weakens upwards, often rough in upper part on back, often ending in spine on back. Leaf cells loosely areolated as a whole, pellucid, median cells linear-fusiform, $57 \times 7 \mu$, somewhat papillose by the projecting upper ends, basal cells much broader, quadrate, thin-walled, forming a large and very pellucid cluster across the whole base. Seta delicate, smooth, 10–12 mm. Capsules 1.7×0.8 mm, reddish brown, oblong-cylindric, slightly arcuate, inclined. Operculum conic-apiculate, 0.5 mm high, 0.45 mm wide. Autoicous.

Specim. exam.: **Honshū**. Pref. Aomori: Mt. Hakkōda *Mizs.* 9083. Pref. Tochigi: Shiobara *Sak.* 512 (orig. specim.). Pref. Nagano: Mt. Togakushi *Tak.* 12234. **Kyūshū**. Pref. Miyazaki: Hinokage-machi *Nog.* 30874.

Range: Japan (Honshū and Kyūshū).

34. *Brachythecium uematsui* Broth. (Fig. 25)

Brachythecium uematsui Broth. in Över. Finsk. Vet.-Soc. Förh. **62**: 53 (1919–1920); in Engl. Pfl.-fam. **11**: 364 (1925); Dixon in Rev. Bryol. **4**: 159 (1931); Sakurai in Bot. Mag. Tokyo, **50**: 623 (1936); Musc. Jap. 137, pl. 54-c (1954).

A very minute and delicate plant, resembling *B. sakuraii* in appearance, forming dense and low (5–7 mm high), yellowish green mats. Stems creeping, densely branching. Branches erect, somewhat terete-foliate. Stem leaves widely cordate-ovate, usually rapidly narrowing to a very long slender acumen, 2×0.9 m, concave, not plicate; margins minutely serrulate or nearly entire in all around; costa stout at base, rapidly weakens upwards, extending beyond the middle; median leaf-cells rhomboidal, $45 \times 10 \mu$, somewhat papillose by the projecting upper ends, basal cells looser, rectangular, alar cells quadrate, very numerous, thinly walled. Branch leaves similar to the stem leaves in form, often gradually tapering to hyaline acumen. Seta 10–12 mm, slightly rough above, rarely smooth throughout, arcuate when dry. Capsules $1.4\text{--}1.7 \times 0.75\text{--}0.8$ mm, reddish brown, oblong-cylindric, arcuate, inclined. Operculum longly conic, apiculate. Autoicous.

Specim. exam.: **Hokkaidō**. Prov. Kamikawa: Mt. Daisetsu *Ando* 2956. Prov. Kushiro: Mt. Oakan *Ando* 2639. **Honshū**. Pref. Akita: Mt. Asahi *Nog.* 15863. Pref. Yamagata: Mt. Atsumi *Nog.* 16310, Mt. Chōkai *Ikeg.* 18590. Pref. Iwate: Nishiiwai-gun *Ando* 14605. Pref. Miyagi: Aoso *Uematsu* 125 (orig. specim.).

Range: Japan (Hokkaidō and northern Honshū).

35. *Brachythecium rhynchostegielloides* Card. (Fig. 25)

Brachythecium rhynchostegielloides Card. in Bull. Soc. Bot. Gen. ser. 2, **3**: no. 7 (1911);

Fig. 24.

1–15. *Brachythecium noguchii* Takaki

16–21. *B. sakuraii* Broth. (orig. specim.)

1. Stem leaf ($\times 35$). 2, 3. Branch leaves ($\times 35$). 4. Marginal part of stem leaf ($\times 155$). 5. Median cells of stem leaf ($\times 155$). 6. Basal angle of stem leaf ($\times 155$). 7. Perichaetium ($\times 12$). 8, 9, 10. Perichaetial bracts ($\times 24$). 11, 12. Capsules ($\times 12$). 13, 14, 15. Peristome teeth ($\times 93$). 16, 17. Branch leaves ($\times 44$). 18. Median leaf cells ($\times 155$). 19. Basal angle of leaf ($\times 155$). 20, 21. Capsules ($\times 12$).

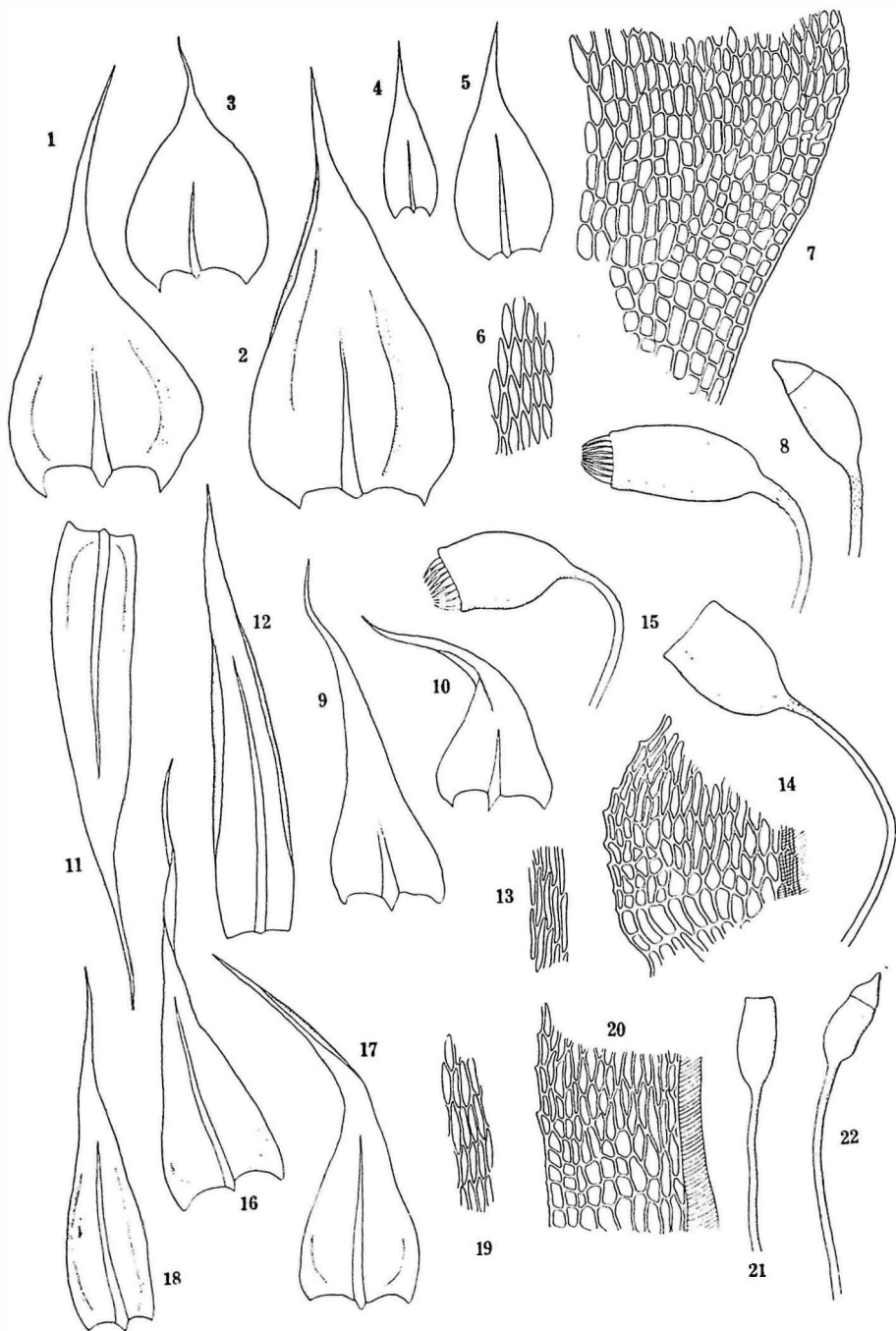


Fig. 25.

Broth. l.c. 364 (1925); Reimers & Sakurai, l.c. 64: 551 (1931); Dixon, l.c. 4: 159 (1931); Sakurai, l.c. 137, pl. 54-t (1954).

Brachythecium rhynchostegielloides var. *macrocarpum* Card. l.c. (1911). Syn. nov.

Brachythecium minutum Broth. in Över. Finsk. Vet.-Soc. Förh. 62: 52 (1919-1920); Broth. l.c. 364 (1925); Sakurai in Bot. Mag. Tokyo, 48: 392 (1934); Musc. Jap. 137, pl. 54-g (1954). Syn. nov.

Ishibaea japonica Broth. et Sh. Okam. var. *angustifolia* Ihsiba in Trans. Sapporo Nat. Hist. Soc. 13: 394 (1934). Syn. nov.

Plant small, in dense intricate low patches, light green, somewhat glossy. Stems creeping, radiculose, irregularly branching. Branches short, 5-7 mm long, erect or ascending. Stem leaves usually narrowly cordate-triangular, tapering to a long, falcate acumen, hardly decurrent, 1.1×0.34 mm; margins serrate all around; costa stout at base, extending $1/2$ length of leaf, often very short; median leaf-cells narrowly linear, somewhat vermicular, $56 \times 4.4 \mu$, towards base larger, oblong-hexagonal, alar cells quadrate, opaque. Branch leaves narrowly lanceolate, gradually longly acuminate, 1.4×0.24 mm; margins more serrate than in stem leaves; costa $3/5$, stout. Seta slightly papillose in the upper part only, reaching 22 mm long. Capsules small, 1.4×1 mm, oblong-ovoid, inclined or horizontal.

Specim. exam.: **Hokkaidō**. Is. Rishiri: Hatt. 21986. Prov. Ishikari: Jōzankei Nog. 28053, 30012. **Honshū**. Pref. Aomori: Oirase Mizs. 4787, Tanabe Nog. 21271, Kanita U.F. 1991 (orig. specim. of *B. rhynchostegielloides*), Mt. Hakkōda Murai (orig. specim. of *Ishibaea japonica* var. *angustifolia*), do. Ihsiba 138 (orig. specim. of *B. minutum*). Pref. Akita: Senboku-gun Nog. 15933, 15963, Kitaakita-gun Nog. 15867, 15934. Pref. Iwate: Nishiiwai-gun Ando 14513. Pref. Fukushima: Mt. Hiuchi Mizs. 5282. Pref. Gumma: Oze Toy. 58. Pref. Niigata: Is. Sado Ikeg. 23310. Pref. Nagano: Mt. Shirouma Tak. 6883, Mt. Happō Tak. 10231, 10257. Pref. Gifu: Mt. Hakusan Tak. 9249, 9306, 10141. Pref. Nara: Mt. Miseno Nog. 29118. Pref. Ōsaka: Mt. Katsuragi Mizt. 141, Mt. Iwawaki Mizt. 1882. Pref. Hyōgo: Hinoyama Nog. 18918, Mt. Rokkō Mizt. 1426. Pref. Tottori: Mt. Daisen U.F. 834 (orig. specim. of *B. rhynchostegielloides* var. *macrocarpum*). Pref. Okayama: Maniwa-gun Igi 2493. **Kyūshū**. Pref. Ōita: Mt. Yufu Nog. 19248, Mt. Kujū Nog. 3136, Mt. Sobo Nog. 28297.

Range: Japan (Hokkaidō, Honshū and Kyūshū).

Sect. *Cirriphyllopsis* (Broth.) Takaki, stat. nov.

Brotherus regarded this group as a subgenus in Engler's "Pflanzen-familien (1909)," but the author treats it here as a section, in order to make it proportionate to other sections.

The following points are remarkable characters of this section: Leaves slightly or not decurrent, usually not plicate, alar cells densely chlorophyllose, quadrate and

Fig. 25.

1-8. *Brachythecium uematsui* Broth. (orig. specim.)

9-22. *B. rhynchostegielloides* Card. (9-15: orig. specim.; 16-22: orig. specim. of *B. minutum*)

1, 2. Stem leaves ($\times 30$). 3, 4, 5. Branch leaves ($\times 30$). 6. Median cells of stem leaf ($\times 155$). 7. Basal angle of stem leaf ($\times 155$). 8. Capsules ($\times 12$). 9, 10, 16, 17. Stem leaves ($\times 44$). 11, 12, 18. Branch leaves ($\times 44$). 13, 19. Median cells of stem leaf ($\times 155$). 14, 20. Basal angle of stem leaf ($\times 155$). 15, 21, 22. Capsules ($\times 12$).

opaque; seta rough above with low papillae, nearly smooth below.

In the "Pflanzenfamilien (1952)" the following species are recorded under the subgenus *Cirriphyllopsis* from the present areas; they are *B. populeum*, *B. densirete*, *B. minutum*, *B. laxitextum* (this species is also cited at the same time under the subg. *Salebrosum* in this book), *B. plumosum*, *B. quelpaertense* and *B. brevirameum*. Besides, three species, *B. truncatum*, *B. acroporioides* and *B. yamamotoi*, were described under this group by other authors. In the present revision, 4 species (including two new) are recognized.

Key to the species

- | | | | |
|---|---|---|---------------------------|
| 1 | { | Costa extending 2/3 to 4/5 length of leaf..... | 2 |
| | { | Costa extending to the apex of leaf..... | 3 |
| 2 | { | Medium to robust plant; capsules oblong-ovoid..... | <i>B. plumosum</i> |
| | { | Very minute plant; capsules small and oval..... | <i>B. pygmaeum</i> |
| 3 | { | Leaves lanceolate to cordate-ovate, somewhat concave..... | <i>B. populeum</i> |
| | { | Leaves broadly ovate, extremely concave..... | <i>B. cochlearifolium</i> |

36. *Brachythecium plumosum* (Sw.) Bryol. Eur.

Brachythecium plumosum (Sw.) Bryol. Eur. fasc. 52-54, pl. 537 (1853); S. Lac. in Ann. Mus. Bot. Lugd.-Bat. 2: 298 (1866-67); Besch. in Ann. Sci. Nat. ser. 7, Bot. 17: 377 (1893); Card. in Beih. Bot. Centbl. 17: 33 (1904); 19: 133 (1905); Okamura in Jour. Coll. Sci. Imp. Univ. Tokyo, 38 (4): 90 (1916); Broth. in Engl. Pfl.-fam. 11: 365 (1925); Reimers & Sakurai in Bot. Jahrb. 64: 552 (1931); Dixon in Rev. Bryol. 4: 160 (1931); Bartr. in Philip. Jour. Sci. 298, pl. 22, f. 380 (1939); Sakurai, Musc. Jap. 137, pl. 54-e (1954).

Hypnum plumosum Sw. Dips. Musc. Suec. 66 (1799); Lindb. in Act. Soc. Sci. Fenn. 10: 251 (1872).

Hypnum plumosum Hedw. Sp. Musc. 257 (1801).

Hypnum pseudo-plumosum Brid. Musc. Rec. 2: 108 (1801); Mitt. in Trans. Linn. Soc. Lond. ser. 2, Bot. 3: 185 (1891); Broth. in Hedw. 38: 239 (1899); Paris in Bull. Herb. Bois. ser. 2, 2: 931 (1932).

Hypnum flagellare Hedw. Sp. Musc. 282, pl. 73, f. 1-3 (1801).

Brachythecium populeum f. *robustum* Broth. ex Ihsiba in Bot. Mag. Tokyo, 49: 601 (1935); Sakurai, l.c. 189 (1954). Syn. nov.

Brachythecium acroporioides Dix. et Thér. in Rev. Bryol. 4: 161 (1931); Sakurai, l.c. 137 (1954). Syn. nov.

Brachythecium populeum var. *seta-sublaeve* Broth. ex Ihsiba, l.c. 601 (1935); Sakurai, l.c. 189 (1954). Syn. nov.

Brachythecium salebrosiforme Dix. et Ther. l.c. 157 (1931). Syn. nov.

Rhynchostegium Doii Sakurai in Bot. Mag. Tokyo, 46: 746 (1932). Syn. nov.

Musci Japonici Exsiccati ser. 7, no. 303 (1935), labeled as *Brachythecium buchanani* (Hook.) Jaeg.

Plants medium to robust in size, forming dense, brownish green and glossy tufts. Stems prostrate, irregularly branching. Stem leaves crowded, erect-patent when moist, more imbricate or somewhat spreading when dry, broadly ovate-lanceolate, slightly decurrent, acuminate, concave, slightly or not plicate; costa extending 2/3 length of leaf; margins nearly entire or minutely serrulate all around; median leaf-cells linear-oblong to oblong-hexagonal, walls firm, alar cells subquadrate, thick-walled, forming opaque area. Branch leaves ovate-lanceolate, concave,

not plicate. Seta rough above, smooth below. Capsules oblong-ovoid, inclined. Operculum conical, acute. Peristome normal. Autoicous.

Specim. exam.: **Hokkaidō**. Is. Rishiri: *Hatt.* 21886. Prov. Hidaka: Mt. Apoi *Iwaz. & Tak.* 16195, 16228, 16194, 16227. Prov. Kushiro: Mt. Oakan *Ando* 2644. **Honyū**. Pref. Aomori: Shimokita-gun *Nog.* 21226, 21277, 21274, Kamikita-gun *Mizs.* 4610. Pref. Akita: Jindai-mura *Kanno* 9, Mt. Komagatake *Kanno* 210. Pref. Yamagata: Mt. Chōkai *Asano* 109, Yamagata-shi *Igura* 121. Pref. Iwate: Mt. Murone *Nog.* 3053, Kunohe-gun *Nog.* 34094, Mt. Hayachine *Ihsiba* (orig. specim. *B. populeum* var. *seta-sublaeve*). Pref. Miyagi: Mt. Karita *Nog.* 3537, Sendai *Nog.* 4381, Kinkazan *Ihsiba* (orig. specim. of *B. populeum* var. *robustum*). Pref. Fukushima: Yama-gun *Ando* 14724, Ishiki-gun *Ikeg.* 34276. Pref. Gumma Tone-gun *H.O.* 184. Pref. Tochigi: Nikkō *Tak.* 507, *Nog.* 3533, 29776, 2823, 3486, 516, Mt. Shirane *Tak.* 523, Tano-gun *Mizs.* 3610, Shimotsuga-gun *Ikeg.* 30038. Pref. Saitama: Ōtaki-mura *Nog.* 20630, Mt. Mitsumine *Tak.* 4505, Urayama-mura *Nag.* 1421, Ōchigawa *Nag.* 2292. Pref. Chiba: Mt. Kiyozumi *Nog.* 4396, *Tak.* 1155, 1159, 1217, 1205, 1223, 1163, 1177. Pref. Tōkyō: Is. Aogashima *Mizs.* 8794, Is. Ōshima *Mizs.* 2796, Mitaka-shi *Mizs.* 8545, Fuchū-shi *Mizs.* 6293, Nishitama-gun *Mizs.* 2852, Ōmiya-shi *Mizs.* 8647, Iruma-gun *Mizs.* 6544, Mt. Takanosu *Ikeg.* 21138, Mt. Takao *Tak.* 1027, 1028, Mt. Kariyose *Tak.* 2228, Mt. Takamizu *Tak.* 1000. Pref. Kanagawa: Jimmuji *Nak.* 86, Ashigarashimo-gun *Nog.* 29782, Mt. Hakone *Nog.* 4386, Ōfuna *Sas.* 4806 (orig. specim. of *B. acropycnoides*). Pref. Nagano: Mt. Ontake *Tak.* 13819, 14059, Mt. Yatsugatake *Tak.* 4701, Sugadaira *Tak.* 816, Mt. Kisokoma *Ikeg.* 8481, Kirigamine *Tak.* 6400, Mt. Shirouma *Tak.* 7238, 7360, Yumata *Tak.* 10550, Mt. Happō *Tak.* 10234, Mt. Asama *Mizs.* 2956, Southern Alps, Todai *Iwaz.* 755, Ōkawara *Tak.* 644, Koshibuyu *Tak.* 642, 6672, 6619, Shimoina-gun *Nog.* 30475, 30528. Pref. Aichi: Mt. Chausu *Tak.* 12924, 12959, Adera *Tak.* 5558, Mt. Hongū *Tak.* 3883, Motojuku *Tak.* 3603, Mt. Mikuni *Tak.* 13633, Mennoki pass *Tak.* 10965, 10993, Kamitsugu-mura *Tak.* 10912, 10918, Mt. Danto *Tak.* 5204, 5197, 5175, 10702, Ōnyū *Tak.* 11038, Nanasato-mura *Tak.* 5621, Toyone-mura *Tak.* 7752, 7797, Kuroze *Tak.* 4163, Taguchi *Tak.* 7412, 10897, Miwa-mura *Tak.* 4614, Mt. Ryūtō *Tak.* 7660, Miyazaki-mura *Tak.* 3928. Pref. Shizuoka: Mt. Manzanburō *Tak.* 7860, Iwata-gun *Mizt.* 545, Ōma *Tak.* 10568, 10592, 10633, Mt. Amagi *Tak.* 7893, *Nog.* 2628, 2692, 2931. Pref. Niigata: Is. Sado *Ikeg.* 23319, Mt. Myōkō *Nog.* 13175, Kitakambara-gun *Ikeg.* 11050, Nakakambara-gun *Ikeg.* 26313, Iwatune-gun *Ikeg.* 10939, Minamiuonuma-gun *Ikeg.* 18188, Higashikambara-gun *Ikeg.* 9724. Pref. Gifu: Shirakawa-mura *Tak.* 9266, Yōrō *Tak.* 5307, 5308. Pref. Ishikawa: Hagui-gun *Ikeg.* 29248. Pref. Mie: Mt. Ōdaigahara *Mizt.* 583, Ujiyamada *Mag.* 1717, Mt. Komono *Mag.* 2886, Mt. Shaka *Tak.* 11091, Akame *Tak.* 5450, 5457, Owase *Tak.* 10845. Pref. Shiga: Mt. Ryūgatake *Nak.* 15723. Pref. Kyōto: Mt. Hiei *Tak.* 1290, Kasa-gun *Nak.* 4067, Kitakuwata-gun *Nak.* 5550, Kibune *Mizt.* 597, Kyōto *Nog.* 28560, Mt. Ōe *Nak.* 4230, Ashiu *Nak.* 5675, Rurikei *Nak.* 5373, Ōhara *Nak.* Pref. Nara: Ikoma-gun *Mizt.* 640, Mt. Kasuga *Mizt.* 1820, Mt. Misen *Nak.* 3076, *Nog.* 2967, 3133, 29146, Mt. Tōnomine *Nak.* 3317. Pref. Hyōgo: Mt. Rokkō *Mizt.* 1600, Mt. Akanishi *Nog.* 19600, Mt. Funakoshi *Nog.* 20957, 25292, Yabu-gun *Nog.* 22521. Pref. Wakayama: Hanazono-mura *Nak.* 641, Kitayama-mura *Nak.* 1098, Mt. Kōya *Nog.* 16468, Mt. Nachi *Nog.* 4767, *Tak.* 10857, Mt. Gomadan *Nak.* 650, Mt. Kōjin *Nak.* 1621. Pref. Ōsaka: Mt. Katsuragi *Nak.* 1840, *Nog.* 26890, Mt. Kongō *Nog.* 26901, Mt. Hoshidamyōken *Nog.* 16894, Ushitaki *Nog.* 26902, *Nak.* Mt. Inunaki 450, Mt. Iwao *Nak.* 2480, Kishiwada-shi *Nak.* 178, Mt. Nosemyōken *Nak.* 5407, Ikeda-shi *Ikeg.* 7819. Pref. Tottori: Mt. Daisen *Nog.* 28976, Yazu-gun *H.O.* 1491. Pref. Shimane: Miinohara *Nog.* 22260, Gakuenji *Nog.* 30056, 30051, Matsue-shi *Ikeg.* 2057, Is. Ōki *Nog.* 36871. Pref. Okayama: Atsutsu-gun *Nog.* 22675, Katsuda-gun *Igi* 2435, Mt. Ushiroyama *Igi* 1076, Jōbō-gun *Igi* 227. Pref. Hiroshima: Mt. Fukuōji *Nog.* 2280, *Tak.* 7321, Hiroshima-shi *H.O.* 510, Saheki-gun *H.O.* 566, Mt. Kammuri *Nog.* 30863. Pref. Yamaguchi: Yoshiki-gun *Nog.* 16148. **Shikoku**. Pref. Ehime: Shūsō-gun *Mizs.* 6775, Nii-gun *K.O.* 191, Mt. Ishizuchi *K.*

O. 2326, Uma-gun *K.O.1854*. Pref. Tokushima: Myōzai-gun *Nog. 16449*. Pref. Kōchi: Mt. Kuishi *Nog. 15740*. **Kyūshū**. Pref. Nagasaki Mt. Unzen *Nog. 33101, 33116*. Pref. Fukuoka: Mt. Hōman *Nog. 7928, 7964*, Mt. Hossin *Nog. 7989*. Pref. Kumamoto: Hitoyoshi *Nog. 25810*, Mt. Ichibusa *Nog. 4400, 43704*, Isshōchi *Nog. 27137*, Ichibu-mura *Mayeb. 193*, Aida *Nog. 3496, 13534, 18673*, Kōnose *Mayeb. 152*, Mt. Shakain *Tak. 2319*, Mt. Onitake *Tak. 2931*, Uemura *Mayeb. 2276*, Kawa-mura *Mayeb. 2258*, Mt. Ōhira *Mayeb. 441*, Watari *Mayeb. 186*, Mt. Aso *Tak. 1566, Nog. 66, 25460*, Kumamoto *Nog. 21671, 21678, Tak. 2475, 2480*, Mt. Yatake *Nog. 5228, 5239, 2832, 5268, 5231*, Mt. Hei *Nog. 2802*, Mt. Shiraga *Nog. 5197*, Mt. Fukaba *Tak. 2635, 2879*, Mt. Kimbō *Tak. 2557, 4370*, Gokanshō *Tak. 1574*, Mt. Shōdai *Tak. 659*. Pref. Ōita: Usa *Nog. 9092*, Obira *Nog. 28298*, Tenjinyama *Nog. 20622, 20647*, Mt. Ondake *Nog. 20448*, Mt. Jinkakuji *Nog. 19202*, Mt. Kujū *Nog. 3016, 3025, 3061*, Mt. Sobo *Nog. 28358, 28368*, Kawanobori-mura *Nog. 14078*, Mt. Takazaki *Nog. 20074, 29075*, Mt. Nakamatohata *Nog. 28211*. Pref. Miyazaki: Mt. Kirishima *Nog. 4394, 8071*, Mt. Sobo *Nog. 2467, 2938, 28366, Tak. 2024, 2025*, Inohae *Nog. 18375, 18417*, Sakatani-mura *Nog. 18241, 18238, 18274*, Nichinan-shi *Nog. 2164*, Mt. Aoidake *Sas. 2374* (orig. specim. of *B. salebrosiforme*). Pref. Kagoshima: Mt. Takakuma *Nog. 7727*, Hetsuka *Nog. 8360, 8821*, Mt. Karakuni-dake *Nog. 8146*, Yamazaki-mura *Nog. 21883*, Mt. Kirishima *Nog. 8019*, Is. Sakurajima *Nog. 20270, 20287*, Mt. Kaimon *Nog. 20782, 20837*, Mt. Eboshi *Sak.* (orig. specim. of *Rh. doii*), Is. Yaku *Nog. 29209, 19384, 19482*. **Formosa**. Prov. Taichū: Taiwan *Nog. 6983*. Prov. Tainan: Mt. Kodama *Nog. 5844, 6421*. Prov. Takao: Mt. Daibu *Nog. 2378*.

Range: Europe, Spitzbergen, Madeira, Algiers, Caucasus, Asia, North America, New Zealand, Sakhalin, Formosa, Korea and Japan (Hokkaidō, Honshū, Shikoku, Kyūshū).

This is the commonest and most variable species of this section. In the author's collections of this family, this species ranks first in number of specimens. Among the numerous specimens we sometimes come across plants which are so varying in their characters, that they look as if a different species. However, a close examination of numerous specimens has revealed that they are nothing but extreme forms within one and the same species. Some of the species included in this section may be of the same category, nevertheless they are recognized as separate species. On these species, the author placed them in variety-rank. Already many varieties are known under this species. K. Sakurai cited in his "Muscologia japonica" the following varieties: var. *brevisetum*, var. *perrobustum*, var. *striato-plumosum*, var. *scariosifolium* and var. *mimmayae*. The author examined the original specimens of all these varieties.

Bescherelle described *B. truncatum*³⁾ based on the specimen collected by Faurie in Sapporo (Hokkaidō). The author could not find this original specimen among Faurie's herbarium of Kyoto University. Dixon reported this species from Formosa as its second locality, the specimen having been collected on Mt. Nōkō by S. Suzuki. Dixon stated at the same time that *B. truncatum* is extremely near to *B. plumosum*. By the examination of this Formosan specimen, the author observed it seems to be identical with *B. plumosum*, except its seta which is smooth. He supposes it may be synonymous with *plumosum* or its var. *striato-plumosum*. Dixon & Thériot described *B. acroporioides* on account of the foliation which in its rigidity and the convolution of the leaves recalls some species of *Acroporium*. But these forms seem to the author to fall within a single specific conception of *B. plumosum*.

5) *Brachythecium truncatum* Besch. in Ann. Sci. Nat. ser. 7, 17: 374 (1893); Dixon in Rev. Bryol. 4: 160 (1931).

36 a) var. *densirete* (Broth. et Par.) Takaki stat. nov. (Fig. 26)

Brachythecium densirete Broth. et Par. in Rev. Bryol. **31**: 62 (1904); Broth. in Engl. Pfl.-fam. **11**: 365 (1925); Sakurai, Musc. Jap. 137 (1954). Syn. nov.

Plants more or less minute in size, forming dense and low (ca. 5 mm high) tufts. Stems creeping, densely radiculose, closely applied to the substratum, sending up short branches. Branches densely and divergently foliate, radiculose. Stem leaves broadest a little above the base and thence gradually narrowed to a long, narrow apex, less concave, margins minutely serrulate all around; costa reaching $3/4$ length of leaf; median leaf-cells linear-vermicular, $66-73 \times 3.6-4.4 \mu$, incrassate, gradually becoming shorter and wider towards base, at angles shorter, quadrate, more incrassate. Branch leaves narrowly lanceolate; costa $2/3$ length of leaf; margins more serrulate than in stem leaves. Capsules oblong-ovoid. Seta reaching 2 cm long, reddish brown, rough above. Operculum conic-apiculate.

Specim. exam.: **Honshū**. Pref. Aomori: Aomori *U.F.* 870 (orig. specim.). Pref. Gifu: Shirakawa-mura *Tak.* 9251, 9373. Pref. Nara: Mt. Misen *Nak.* 2966. **Shikoku**. Pref. Ehime: Mt. Ishizuchi *K.O.* 2766.

Range: Japan (Honshū and Shikoku).

This is treated as a separate species by some authors on account of the density of leaf areolation. But many transitional forms are seen as regards such character between this and *plumosum*, so the author considers it as a variety of *plumosum*. The outstanding characters of this variety are the appressed tufts bearing numerous short lateral branchlets, and narrowly deltoid-ovate leaf with dense areolation.

36 b) var. *concavifolium* (Sakurai) Takaki stat. nov. (Fig. 26)

Bryhnia concavifolia Sakurai in Bot. Mag. Tokyo, **47**: 339 (1933); Mus. Jap. 139 (1954). Syn. nov.

Plants medium to robust in size, golden or yellowish brown, forming widely intricate mats. Stems and branches markedly flexuose with spreading or homomallous leaves, irregularly branching. Stem leaves broadly ovate-lanceolate, asymmetric, tapering to a short and oblique acumen, 2.4×1.0 mm, slightly decurrent, very concave, margins nearly entire or minutely serrulate upper half; costa reaching $4/5$, not ending in spine on back; median leaf-cells linear-fusiform, basal cells much larger, often tinged with an orange-brown colour. Branch leaves similar to stem leaves in form and other characters. Seta ca. 10 mm, rough above. Capsules oblong-ovoid, inclined.

Specim. exam.: **Honshū**. Pref. Nara: Mt. Ōdaigahara *Mizt.* 1332. **Kyūshū**. Pref. Kagoshima: Is. Yakushima *Sak.* 2847 (orig. specim.).

Range: Japan (Honshū and Kyūshū).

This is placed by Sakurai under the genus *Bryhnia*. However, it shows closer relation to *Brachythecium plumosum* in many respects, so the author has decided it as a variety of *plumosum*. The very concave and obliquely twisted leaves with markedly reflexed basal margins are the distinguishing characters of this variety.

36 c) var. *nitidum* (Sakurai) Takaki stat. nov. (Fig. 26)

Bryhnia nitida Sakurai in Bot. Mag. Tokyo, **55**: 210, f. 11 (1941). Syn. nov.

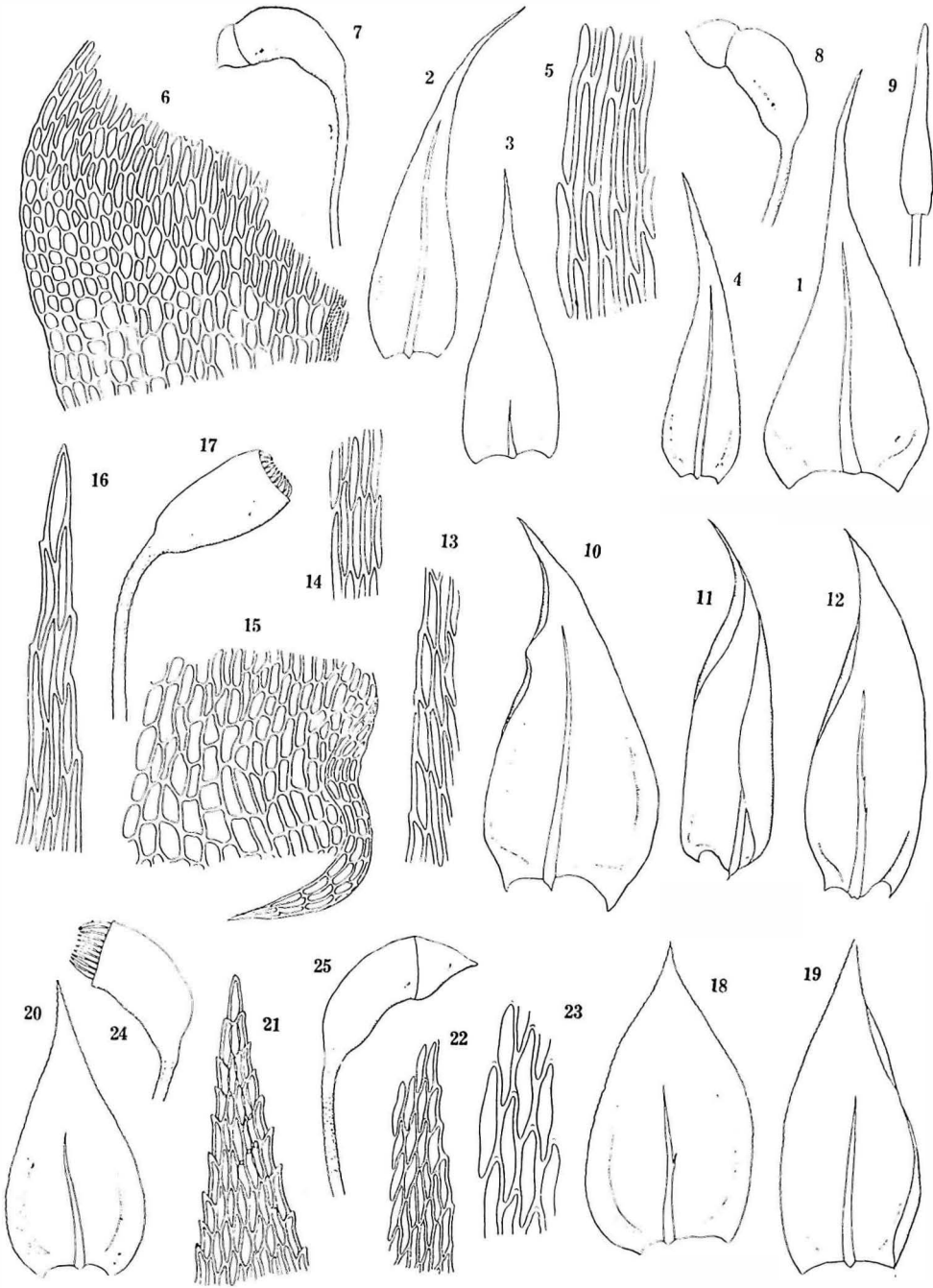


Fig. 25.

Forming dense, low, golden yellow and glossy mats. It has appearance of *Entodon* species. Stems intricate, irregularly dividing with somewhat imbricate foliation. Stem leaves ovate-lanceolate with short acumen, very concave; margins sharply serrate above, minutely serrulate below; costa extending 4/5 length of leaf, often shortly branching at the middle, usually toothed upper half on back; median leaf-cells linear-oblong, papillose by the projecting upper ends on back, alar cells quadrate, incrassate, opaque. Branch leaves similar to stem leaves but more concave and more serrulate on margins. Seta 1.5–1.8 mm, scarcely rough throughout or upper half only. Capsules oblong-ovoid, strongly curved when dry. Operculum conic-apiculate.

Specim. exam.: **Honshū.** Pref. Tōkyō: Is. Aogashima *Mizs.* 8804, 8815. **Shikoku.** Pref. Ehime: Nii-gun *K.O.* 694. **Kyūshū.** Pref. Nagasaki: Nagasaki-shi *Nog.* 33133. **Formosa.** Prov. Tainan: Mt. Arisan *Sak.* 13998 (orig. specim.)

Range: Japan (Honshū, Shikoku, Kyūshū) and Formosa.

This variety was established at first as a species of the *Bryhnia*. But it shows many characters of *Brachythecium plumosum* except the rough leaf-cells and sharply serrate upper margins of leaves. The seta of this original specimen does not bear the striking mamillae as is seen usually in *Bryhnia*. The author considers it preferable to place under *B. plumosum* as a variety.

36 d) var. *scariosifolium* (Besch.) Card. (Fig. 27)

Brachythecium plumosum var. *scariosifolium* (Besch.) Card. in Bull. Soc. Bot. Gen. ser. 2, 3: no. 7 (1911); Sakurai, Musc. Jap. 138 (1954).

It is characteristic that the leaves are somewhat dimorphous, viz. stem leaves are much larger and broadly cordate-ovate, but branch leaves narrowly lanceolate. Both leaves are deeply plicate, areolation somewhat opaque, median leaf-cells more or less papillose by the projecting upper ends, basal areolation thinly walled and looser than in the type, costa long almost reaching apex. Seta long, reaching 3 cm in length, rough above, smooth below. Capsules as in the type.

Specim. exam.: **Honshū.** Pref. Niigata; Nakakambara-gun *Ikeg.* 17449, Nishikambara-gun *Ikeg.* 8052. Pref. Nagano: Southern Alps, Ōshika-mura *Tak.* 11974, Koshibuyu *Tak.* 6654, Mt. Asama *U.F.* 100 (orig. specim.). Pref. Aichi: Mt. Danto *Tak.* 5192, Mt. Ryūzu *Tak.* 7651, Mt. Chausu *Tak.* 12835. Pref. Kyoto: Atago-gun *Mizt.* 402. Pref. Mie: Mt. Gozaisho *Tak.* 11182. Pref. Nara: Mt. Kongō *Mizt.* 370. **Kyūshū.** Pref. Ōita: Mt. Naka-

Fig. 26. *Brachythecium plumosum* (Sw.) Bryol. Eur.

1–9. var. *densirete* (Broth. et Par.) Takaki (orig. specim.)

10–17. var. *concauifolium* (Sak.) Takaki (orig. specim.)

18–25. var. *minutum* (Sak.) Takaki (orig. specim.)

1. Stem leaf ($\times 35$). 2, 3, 4. Branch leaves ($\times 35$). 5. Median cells of stem leaf ($\times 340$). 6. Basal angle of stem leaf ($\times 155$). 7, 8. Capsules ($\times 12$). 9. Young sporogone with calyptra ($\times 12$). 10. Stem leaf ($\times 24$). 11, 12. Branch leaves ($\times 24$). 13. Marginal part of stem leaf ($\times 217$). 14. Median cells of stem leaf ($\times 217$). 15. Basal angle of stem leaf, dorsal view ($\times 155$). 16. Apical cells of stem leaf ($\times 217$). 17. Capsule ($\times 12$). 18, 19. Stem leaves ($\times 24$). 20. Branch leaf ($\times 24$). 21. Apical cells of stem leaf ($\times 155$). 22. Marginal part of stem leaf ($\times 155$). 23. Median cells of stem leaf ($\times 340$).

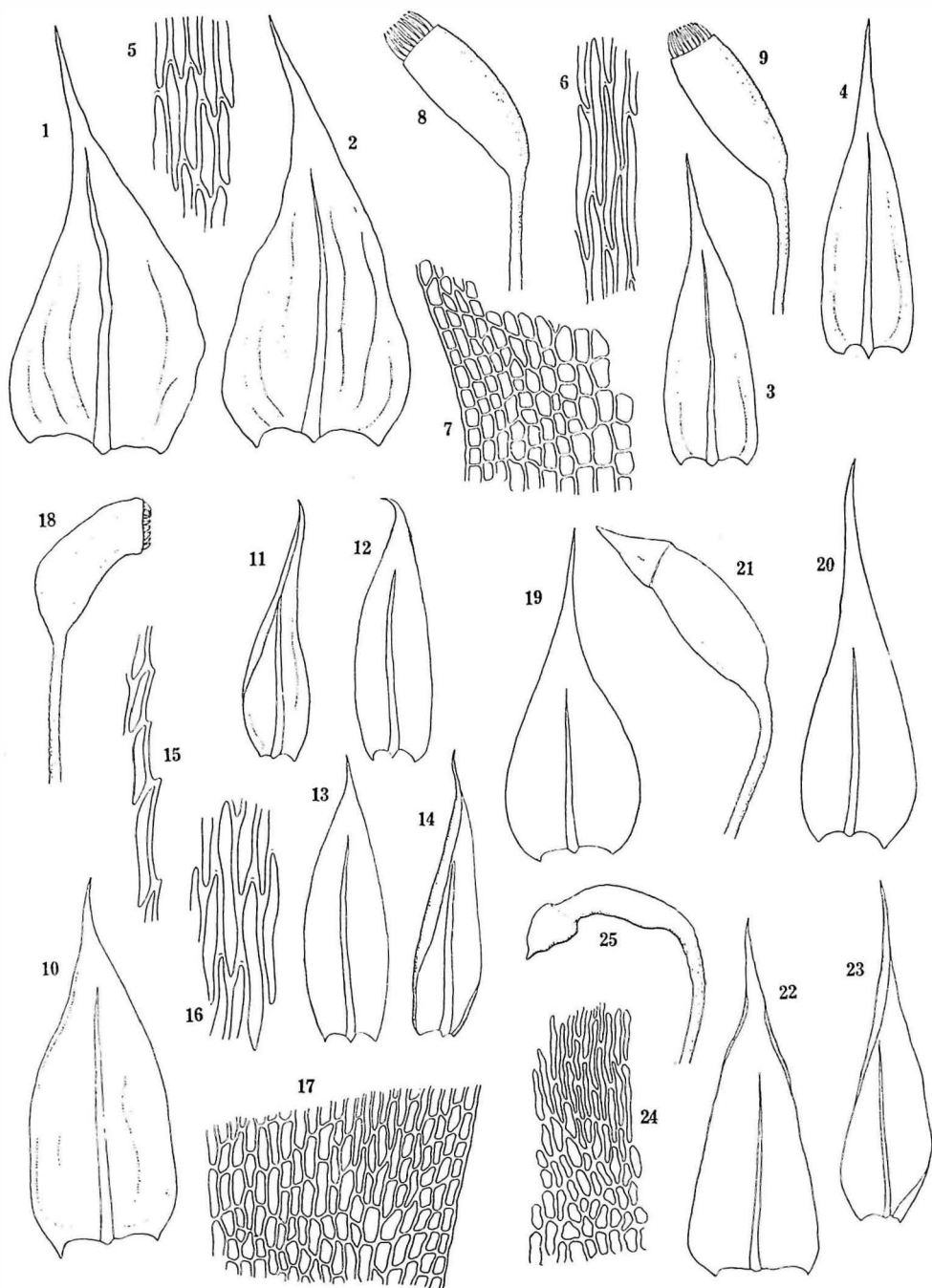


Fig. 27.

matonohata *Nog.* 28220. Pref. Kumamoto: Mt. Shakain *Tak.* 2424, Shimomashiki-gun *Nog.* 29930.

Range: Japan (Honshū and Kyūshū).

36 e) var. *mimmayae* (Besch.) Card. (Fig. 27)

Brachythecium plumosum var. *mimmayae* (Besch.) Card. in Bull. Soc. Bot. Gen. ser. 2, 3: no. 7 (1911); Sakurai, l.c. (1954).

Brachythecium mimmayae Besch. (in litt?).

Brachythecium yakushimense Sakurai in Bot. Mag. Tokyo, 47: 339 (1933); Musc. Jap. 136 (1954). Syn. nov.

It resembles var. *striato-plumosum* and var. *nitidum* in habit, but differs in the leaf form which is oblong-lanceolate and broadest at the middle, and seta throughout rough (but not so striking as in the sect. *Rutabula*, etc.).

Specim. exam.: **Honshū**. Pref. Aomori: Mimmaya *U.F.* 14066 (orig. specim. of var. *mimmayae*). Pref. Niigata: Kitakambara-gun *Ikeg.* 10939, Nakakambara-gun *Ikeg.* 17448, Minamikambara-gun *Ikeg.* 8344, Is. Sado *Ikeg.* 23320. Pref. Nagano: Southern Alps, Koshibuyu *Tak.* 660, Tsubameiwa *Tak.* 12144. Pref. Wakayama: Hanazono-mura *Tak.* 631. Pref. Hyōgo: Mt. Funakoshi *Nog.* 22444. *Nak.* 634. Pref. Hiroshima: Ege *Nog.* 5349, 5350, **Kyūshū**. Pref. Miyazaki: Mt. Sobo *Nog.* 2468, 25302, 25290, 69291. Pref. Kagoshima: Is. Yakushima *Nog.* 29931. *Sak.* 2846 (orig. specim. of *B. yakushimense*).

Range: Japan (Honshū and Kyūshū).

36 f) var. *stenocarpum* Card. (Fig. 27)

Brachythecium plumosum var. *stenocarpum* Card. in Bull. Soc. Bot. Gen. ser. 2, 3: no. 7 (1911).

This variety is characterised by the following points: Stems and branches pro-cumbent, slender, filamentous, loosely foliate, and appearing as if a waste thread; capsules reddish brown, cylindric, symmetric, gradually narrowed to the seta, inclined or horizontal; operculum conic-apiculate.

Specim. exam.: **Kyūshū**. Pref. Ōita: Mt. Yufu *Nog.* 34194 (new to Japan). Korea. Is. Quelpart *U.F.* 423 (orig. specim.).

Range: Japan (Kyūshū) and Korea.

36 g) var. *perrobustum* Sakurai (Fig. 27)

Brachythecium plumosum var. *perrobustum* Sak. in Bot. Mag. Tokyo, 46: 743 (1932); Musc. Jap. 138 (1954).

Fig. 27. *Brachythecium plumosum* (Sw.) Bryol. Eur.

1- 9. var. *scariosifolium* (Besch.) Card. (orig. specim.)

10-18. var. *mimmayae* (Besch.) Card. (orig. specim.)

19-21. var. *stenocarpum* Card. (orig. specim.)

22-25. var. *perrobustum* Sak. (orig. specim.)

1, 2. Stem leaves ($\times 24$). 3, 4. Branch leaves ($\times 24$). 5. Median cells of stem leaf ($\times 340$). 6. Ditto of branch leaf ($\times 340$). 7. Basal angle of stem leaf ($\times 155$). 8, 9. Capsules ($\times 12$). 10. Stem leaf ($\times 24$). 11, 12, 13, 14. Branch leaves ($\times 24$). 15. Marginal part of stem leaf ($\times 340$). 16. Median cells of stem leaf ($\times 340$). 17. Basal angle of stem leaf ($\times 155$). 18. Capsule ($\times 12$). 19. Stem leaf ($\times 24$). 20. Branch leaf ($\times 24$). 21. Capsule ($\times 12$). 22. Stem leaf ($\times 24$). 23. Branch leaf ($\times 24$). 24. Basal cells of stem leaf ($\times 155$). 25. Young capsule ($\times 12$).

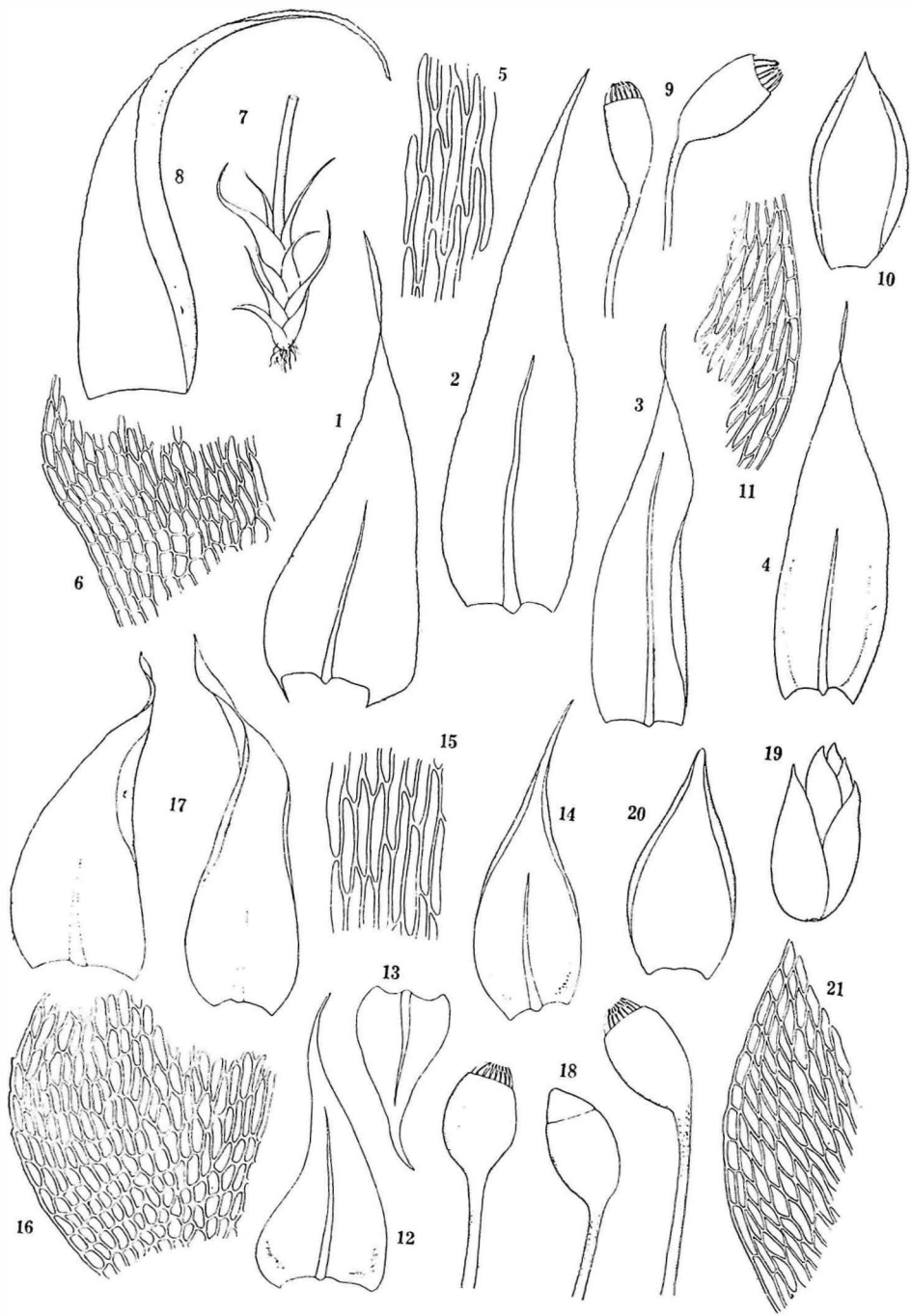


Fig. 28.

Brachythecium populeum var. *brevinerve* Ihsiba in Trans. Sapporo Nat. Hist. Soc. **13**: 394 (1934). Syn. nov.

Brachythecium plumosum var. *sericeo-nitidum* Sak. in Bot. Mag. Tokyo, **51**: 13 (1937); Musc. Jap. 138, pl. 54-q (1954). Syn. nov.

Rhynchostegiella sericeo-nitida (Sak.) Sak. in Bot. Mag. Tokyo, **67**: 149 (1954); Musc. Jap. 185 (1954). Syn. nov.

As the most important character of this species, Sakurai stated that "Planta perrobusta" in the original description. But the author observed in this original specimen that it is not worthy of special mention in comparison with others. But the author observed this specimen has the following characters which give this variety a reason for remaining as a separate variety. Foliation of branch being spreading-open nearly right angle. Basal leaf cells brownish yellow, sinuously in-crassate, elongated. Seta very long, sometimes reaching 3-3.5 cm in length.

Specim. exam.: **Honshū**. Pref. Mie: Kōzu-mura *Mag.* 1059, Ujiyamada *Mag.* 1796, Komono *Mag.* 1261, Ogihara-mura *Mag.* 997. Pref. Ōsaka: Mt. Minoo *Sas.* 15107 (orig. specim. of *B. populeum* var. *brevinerve*). **Kyūshū**. Pref. Kumamoto: Aida-mura *Mayeb.* 319, Hitoyoshi *Sak.* 7935 (orig. specim. of *B. plumosum* var. *sericeo-nitidum*). Pref. Ōita: Fukayabakei *Nog.* 18432. Pref. Miyazaki: Mt. Osuzu *Nog.* 24247. Pref. Kagoshima: Mt. Shibi *Sak.* 2606 (orig. specim. of *B. plumosum* var. *perrobustum*).

Range: Japan (Honshū and Kyūshū).

Ishiba described *B. populeum* var. *brevinerve* basing on the four syntype specimens from the following localities: Mt. Minoo (Pref. Ōsaka), Mt. Katsuragi (Pref. Ōsaka), Nokawa (Pref. Ehime) and Uji (Pref. Kyōto). The author examined the first two specimens and observed both are different taxa. The former is identical with the type of *B. plumosum* and the latter is closely agreeing with var. *perrobustum*. The var. *sericeo-nitidum* which is recently transferred to *Rhynchostegiella* by K. Sakurai who described it first, is a delicate plant but resembles closely var. *perrobustum* in the form of sporogone, aspect of foliation, basal areolation of leaf, etc.

36 h) var. *brevisetum* Sakurai (Fig. 28)

Brachythecium plumosum var. *brevisetum* Sak. in Bot. Mag. Tokyo, 46: 743 (1932); Musc. Jap. 138 (1954).

Brachythecium populeum var. *lanceolatifolium* Ihsiba in Trans. Sapporo Nat. Hist. Soc. **13**: 394 (1934). Syn. nov.

The author observed the original specimen has indeed a short seta (5-10 mm), as is shown in the original description. On the length of seta of the type of

Fig. 28.

1-11. *Brachythecium plumosum* var. *brevisetum* Sak. (*Tak.* 8131)

12-21. *B. pygmaeum* Takaki

1. Stem leaf ($\times 44$). 2, 3, 4. Branch leaves ($\times 44$). 5. Median cells of stem leaf ($\times 340$). 6. Basal angle of stem leaf ($\times 155$). 7. Perichaetium ($\times 13$). 8. Perichaetial bract ($\times 44$). 9. Capsules ($\times 12$). 10. Perigonial bract ($\times 48$). 11. Marginal part of do. ($\times 155$). 12, 13. Stem leaves ($\times 35$). 14. Branch leaf ($\times 35$). 15. Median cells of stem leaf ($\times 340$). 16. Basal angle of stem leaf ($\times 200$). 17. Perichaetial bracts ($\times 35$). 18. Capsules ($\times 12$). 19. Antheridial bud ($\times 12$). 20. Perigonial bract ($\times 48$). 21. Marginal part of do. ($\times 155$).

plumosum, the following measurement has been given by many authors, viz. 7-20 mm by Grout, 1/2-3/4 inch by Dixon, 10-20 mm by Roth and 22 mm by Bartram. Regarding this point, the Japanese specimens of the type have generally longer seta reaching often as long as 3.5 cm in length, and it is rather rare to see the seta less than 2 cm in length. Accordingly, such a short seta as is seen in var. *brevisetum* is especially prominent among the Japanese materials. So, the shortness of seta seems, taking up only this character, to be not so important for the separation as a variety. But this original specimen has, in addition to such character of seta, a very delicate habit and sharply serrate leaves with costa ending usually in spine on its back. After all, the author agrees to cite it as a separate variety.

Specim. exam.: **Hokkaidō**. Is. Rishiri: *Hatt.* 22043. **Honshū**. Pref. Ōsaka: Kitakawachi-gun *Nak.* 2690, Kaizuka-shi *Nak.* 2042. Pref. Mie: Watarai-gun *Mag.* 400. Pref. Wakayama: Minamimuro-gun *Koide* (orig. specim. of *B. populeum* var. *lanceolatifolium*). **Kyūshū**. Pref. Kagoshima: Mt. Shigehira *Sak.* 2588 (orig. specim. of var. *brevisetum*), Kagoshima-shi *Sak.* 2586 (orig. specim. of var. *brevisetum*), Is. Sakurajima *Tak.* 8013.

Range: Japan (Hokkaidō, Honshū and Kyūshū).

36 i) var. *striato-plumosum* Dix. et Sak.

Brachythecium plumosum var. *striato-plumosum* Dix. et Sak. in *Bot. Mag. Tokyo*, 50: 622 (1936); Sakurai, l.c. 138 (1954).

Dixon & Sakurai described this variety, regarding the smooth seta and irregularly plicate and longly costate branch leaves with tortuose apex as the distinguishing characters. Among these characters, the smoothness of seta is somewhat remarkable, but the rest seems to the author to be not so important because of their being seen generally in the type and other varieties.

Specim. exam.: **Honshū**. Pref. Nagano: Southern Alps, Koshibuyu *Tak.* 6654. Pref. Shimane: Hamada-shi *Nog.* 29038. **Kyūshū**. Pref. Ōita: Fukayabakei *Nog.* 18958. Pref. Kumamoto: Mt. Naidaijin *Sak.* 7023 (orig. specim.).

Range: Japan (Honshū and Kyūshū).

37. *Brachythecium pygmaeum* Takaki sp. nov. (Fig. 28)

Autoicum. Planta pygmaea, caespitosa, caespitibus densis, flavo-viridibus, nitidiusculis. Caulis repens, brevis, ad 2 cm longus, dense fusco-radiculosus, irregulariter ramosus, ramis erectis, brevibus, minutissime et dense foliosis, obtusis, usque ad 3 mm longis, simplicibus, cum foliis ca. 1 mm latis. Folia sicca subadpressa, humida patentia. Folia caulina e basi cordata vel rotundato-cordata, longe acuminata, in subulato attenuata, 0.7-1.0×0.35-0.5 mm, asymmetrica, concaviuscula; marginibus subintegerrimis, haud decurrentia; nervo valido, 3/4 folii evanido; cellululae laminarum leves, oblongo-hexagonis, 40-50×4.4 μ, sensim versus basin breviterque laxioribus, alaribus numerosisque quadratis, folia ramae e basi ovato-lanceolata, in acumen subulato-piliforme attenuata, ca. 1.3×0.4 mm, concava. Bractae perichaetii internae multo majores, erectae, anguste oblongae raptim in acumen breviter angustum subulatae, involutae, ad 1.4 mm longae, costa tenui, marginibus integris, paraphysibus paucis. Seta ca. 7-8 mm longa, rubra, tenuis, superne plus minus scabra. Folia perigonialia intimae e basi truncata obovata subito in acumen brevior et latior acutum contracta, enervia, limbata. Theca suberecta vel inclinata,

elliptica ovalia vel globoso-ovalia, castanea, ca. 1.1 mm longa et ca. 0.85 mm crassa. Annulus ignota. Exostomii dentes lanceolato-subulati, 0.37 mm longi et 0.08 mm lati, lutei, e medio ad apicem hyalini et papilloși, anguste hyalline limbati, transverse striatuli; endostomium luteum papillosum; corona basilaris ca. 0.14 mm alta; processus dentium lanceolato-subulatus, carinatus, in carina rimosus; cilia 2-3, bene evoluta nodulosa hyalina papillosa. Spori leaves. Operculum conicum vel convexo-conicum et apiculatum, ca. 0.4 mm longum et ca. 0.65 mm in diam.

Specim. exam.: **Hokkaidō**. Is. Mt. Rishiri: Rishiri, summit, *Tak.* 15380—Holotype, leg. *Z. Iwatsuki* Aug. 10, 1954.

Range: Japan (Hokkaidō).

The outstanding characters of this species are the very minute size of plant and sporogone, stout costa of leaf, and small and oval capsule.

38. *Brachythecium populeum* (Hedw.) Bryol. Eur.

Brachythecium populeum (Hedw.) Bryol. Eur. fasc. 52-54, pl. 535, 536 (1835); Broth. in Hedw. **38**: 240 (1899) Cardot in Beih. Bot. Centbl. **17**: 33 (1904); Okamura in Jour. Coll. Sci. Imp. Univ. Tokyo, **36** (7): 42 (1915); Broth. in Engl. Pfl.-fam. **11**: 365 (1925); Reimers & Sakurai in Bot. Jahrb. **64**: 551 (1931); Okamura in Makino, Nippon Syokubutsu Zukan. 981, f. 2940 (1940); Sakurai, l.c. 138 (1954).

Hypnum populeum Hedw. Sp. Musc. 270, pl. 70, f. 1-6 (1801).

Brachythecium populeum var. *kominaticum* Besch. in Ann. Sci. Nat. ser. 7, **17**: 376 (1893). Syn. nov.

It is the commonest and very variable species like *B. plumosum*. Both species are distinguished by the following points, besides that shown in the key.

B. populeum

1. Plants usually slender, forming rather compact mats.
2. Branches slender, usually erect or sometimes curved.
3. Median leaf-cells broader and shorter than in the other, 5-8: 1 in branch leaf.
4. Capsules shortly ovoid, 2: 1.
5. Costa stout throughout.

B. plumosum

1. Plants robust, forming more intricate mats.
2. Branches stout, usually more curved or flexuose.
3. The same cells linear, sometimes vermicular, 8-12: 1 in branch leaf.
4. Capsules oblongly ovoid, 2.5: 1.
5. Costa gradually evanescent.

Specim. exam.: **Hokkaidō**. Is. Rebun: Anama *Hatt.* 21703, Kabuka *Hatt.* 21660. Is. Rishiri: Mt. Rishiri *Iwaz. & Tak.* 15142. Prov. Ishikari: Jōzankei *Nog.* 30016, 27962, 29969, 30356, 30371. Prov. Kamikawa: Kamuikotan *Nog.* 30128, 30131. Mt. Daisetsu *Nog.* 27061, Nishishibetsu *Nog.* 25333, 26602. Prov. Kushiro: Mt. Meakan *Nog.* 27983, Mt. Oakan *Ando* 2659. Prov. Oshima: Hakodate *Nog.* 30193. **Honshū**. Pref. Aomori: Shimokita-gun *Nog.* 21124, Nakatsugaru-gun *Mizs.* 6064, Minamitsugaru-gun *Mizs.* 5976, Oirase *Mizs.* 4736, Kominato *U.F.* 38 (orig. specim. of var. *kominaticum*). Pref. Iwate: Iwate-gun *Nog.* 25613. Pref. Miyagi: Sendai *Nog.* 4399. Pref. Akita: Yamamoto-gun *Nog.* 16551, Kawabe-gun *Nog.* 15529, Kitaakita-gun *Nog.* 16549, 30832, Yuri-gun *Nog.* 26576, Mt. Komagatake *Kanno* 220, Honjō-shi *Kanno* 50. Pref. Yamagata: Nishitagawa-gun *H.O.* 1623, Higashitagawa-gun *H.O.* 1703. Pref. Fukushima: Yama-gun *Ando* 14724, Ishiki-gun *Ikeg.* 34275. Pref. Gumma: Oze, Mt. Shibutsu *H.O.* 316, Tano-gun *Nag.* 1441. Pref. Tochigi: Shimotsuga-gun *Ikeg.* 29963. Pref. Saitama: Chichibu *Ikeg.* 20632, Mt. Bukō *Nag.* 3357. Pref. Tōkyō: Mt. Takao *Nak.* 93, Asakawa *Nak.* 2, Fuchū-shi *Mizs.* 6487. Pref. Nagano: Mt. Ontake *Tak.* 13785, 14053, 14073, Kirigamine *Tak.* 6313, 6353, 6396, 8811, Mt. Togakushi *Tak.* 12185, Sugadaira *Tak.*

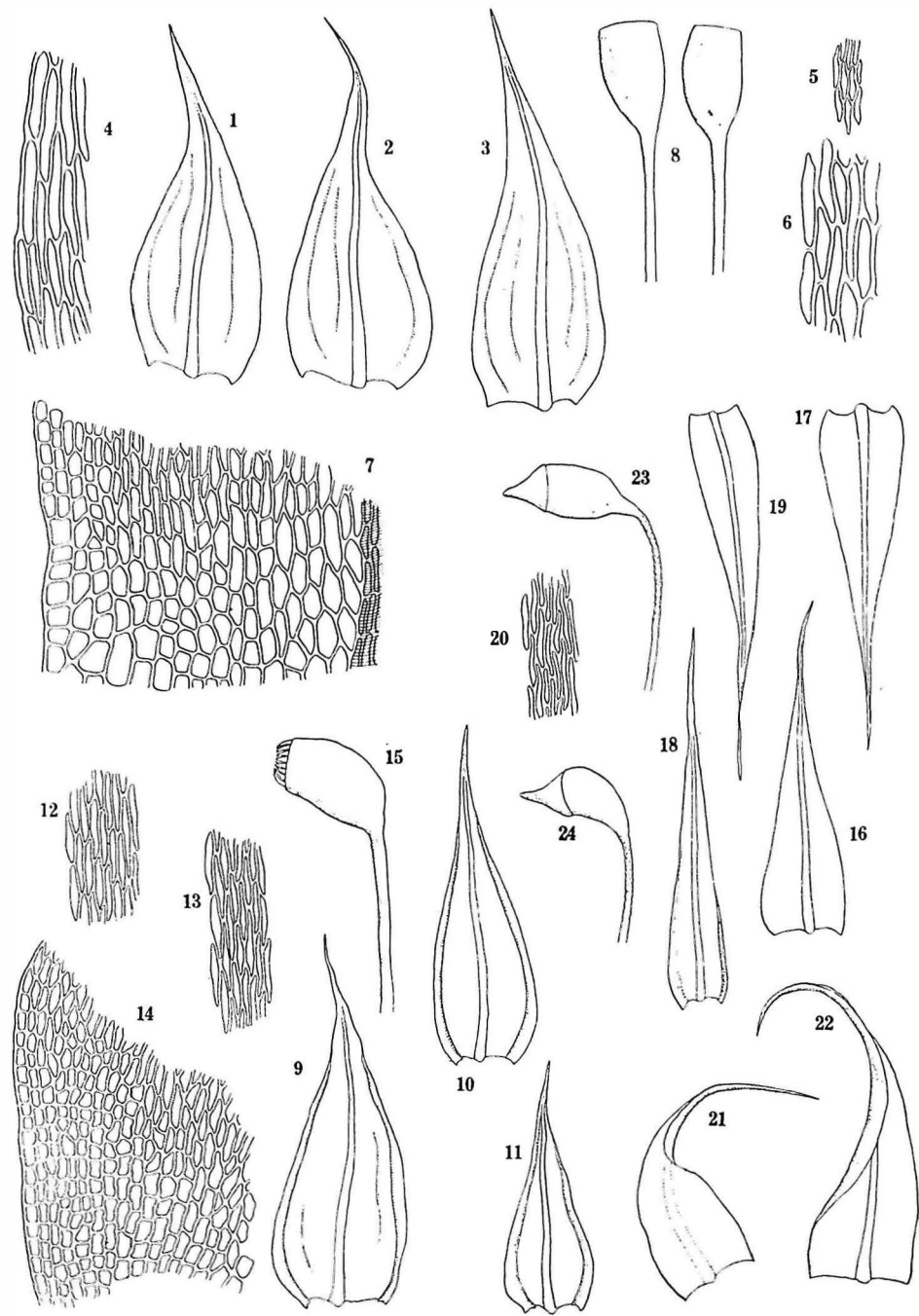


Fig. 29.

854, 1321, Mt. Shirouma *Tak.* 7104, 9419, 9457. Yumata *Tak.* 10556, Southern Alps, Todai *Tak.* 9792, Koshibuyu *Tak.* 643, Mt. Shiomi *Tak.* 15004, Shimoina-gun *Nog.* 30497, Harinoki pass *Tak.* 10483. Pref. Aichi: Mt. Hongū *Tak.* 5846. Pref. Niigata: Takada *Nog.* 13006, 13171, Mt. Myōkō *Ando* 14860, Is. Sado *Ikeg.* 774, Kitakambara-gun *Ikeg.* 8372, Higashikambara-gun *Ikeg.* 19369, Nakakambara-gun *Ikeg.* 12125, Nishikambara-gun *Ikeg.* 8033, Minamikambara-gun *Ikeg.* 8932, Nishikubiki-gun *Ikeg.* 27039, Nakakubiki-gun *Ikeg.* 10098, Kitauonuma-gun *Ikeg.* 35136, Minamiuonuma-gun *Ikeg.* 18126, Santō-gun *Ikeg.* 9329, Iwafune-gun *Ikeg.* 1494, Kamo-shi *Ikeg.* 12716. Pref. Shizuoka: Mt. Shiomi *Tak.* 15007, Senzu *Tak.* 10644, Misakubo *Tak.* 11386. Pref. Gifu: Shirakawa-mura *Tak.* 9220, 9234, 9287, 9297, Mt. Hakusan *Tak.* 9370, Mt. Yōrō *Nog.* 4134, *Tak.* 5311. Mt. Ibuki *Tak.* Pref. Shiga: Mt. Ibuki *Nog.* 28722, Inukami-gun *Nak.* 6312, Mt. Ryōzen *Nak.* 6261, Pref. Kyoto: Kumogahata *Nak.* 25984, Kasa-gun *Nak.* 4074, Mt. Hiei *Nak.* 1504, Kibune *Mizt.* 1794, Funai-gun *Nak.* 5290, Kyōto-shi *Nog.* 28556, 30731, 30734. Pref. Ōsaka: Minō *Nog.* 29101, Mt. Kongō *Nak.* 717, Kaizuka-shi *Nog.* 26903, Kishiwada-shi *Nak.* 758, Mt. Katsuragi *Nak.* 2063, Mt. Inunaki *Nak.* 365, Sennan-gun *Nak.* 442. Pref. Nara: Mt. Tōnomine *Nog.* 28734. Pref. Hyōgo: Tomisumura *Nog.* 21715, Kamino-mura *Nog.* 25305, Shisō-gun *Nog.* 23474. Pref. Mie: Mt. Ōdai *Tak.* 5913, Mt. Fujiwara *Tak.* 13530, 13537. Pref. Wakayama: Mt. Kōya *Nak.* 619. Pref. Tottori: Mt. Mitoku *Inoue* 9199, Tottori-shi *H.O.* 843, Mt. Hanami *Nog.* 5079. Pref. Shimane: Matsue-shi *Nog.* 29011, Mt. Sambe *Nog.* 12229, Kiyomizudera *Nog.* 30401, Anno-gun *Ikeg.* 1185, Gakuenji *Nog.* 30028. Pref. Hiroshima: Taishaku *Nog.* 4639, 4697, 4577, Sandankyō *Nog.* 9032. **Shikoku.** Pref. Ehime: Nii-gun *K.O.* 340, Saijō-shi *K.O.* 9893. **Kyūshū.** Pref. Fukuoka: Mt. Hikosan *Nog.* 19148, Pref. Kumamoto: Mt. Kitamuki *Tak.* 43, Ashikita-gun *Tak.* 2930, Aida-mura *Nog.* 18739, Watari-mura *Mayeb.* 563, Kōnose *Mayeb.* 1337, Mt. Ichibusa *Mayeb.* 508, Yatake *Nog.* 5058, Hitoyoshi (Musc. Jap. Exsiccata no. 303), Mt. Shakain *Tak.* 2383, Mt. Arao *Tak.* 2782. Pref. Ōita: Mt. Kujū *Nog.* 3062, Mt. Jinkakuji *Nog.* 19203.

Range: Europe, Caucasus, Siberia, North America, Korea and Japan (Hokkaidō, Honshū, Shikoku and Kyūshū).

Many varieties are known in this species, as in the case of *B. plumosum*. K. Sakurai cited in his "Muscologia Japonica" the following varieties; var. *angustifolium*, var. *attenuatum*, var. *japonicum*, var. *majus*, var. *amoenum* and var. *longisetum*. In addition to them, var. *seta-sublaeve*, var. *togakusensis*, var. *brevinerve*, var. *lanceolatifolium*, var. *kominaticum* and form. *robustum* are also known. For the clarifying their characters, the author examined as many original specimens as possible. In the present revision, the following 4 varieties are recognized.

38 a) var. *quelpaertense* (Card.) Takaki stat. nov. (Fig. 29)

Brachythecium quelpaertense Card. in Bull. Soc. Bot. Gen. ser. 2, 3: no. 7 (1911); Broth. l.c. 365 (1925). Syn. nov.

Fig. 29. *Brachythecium populeum* (Hedw.) Bryol. Eur.

1- 8. var. *quelpaertense* Card. (orig. specim.)

9-15. var. *japonicum* Dix. et Thér. (orig. specim.)

16-24. var. *yamamotoi* (Sak.) Takaki (orig. specim.)

1, 2. Stem leaves (×24). 3. Branch leaf (×24). 4. Marginal part of stem leaf (×340). 5. Median cells of stem leaf (×155). 6. Ditto (×340). 7. Basal angle of stem leaf (×155). 8. Capsules (×12). 9. Stem leaf (×19). 10, 11. Branch leaves (×19). 12. Median cells of stem leaf (×155). 13. Median cells of branch leaf (×155). 14. Basal angle of stem leaf (×155). 15. Capsule (×9). 16, 17. Stem leaves (×24). 18, 19. Branch leaves (×24). 20. Median cells of stem leaf (×155). 21, 22. Perichaetial bracts (×24). 23, 24. Capsules (×12).

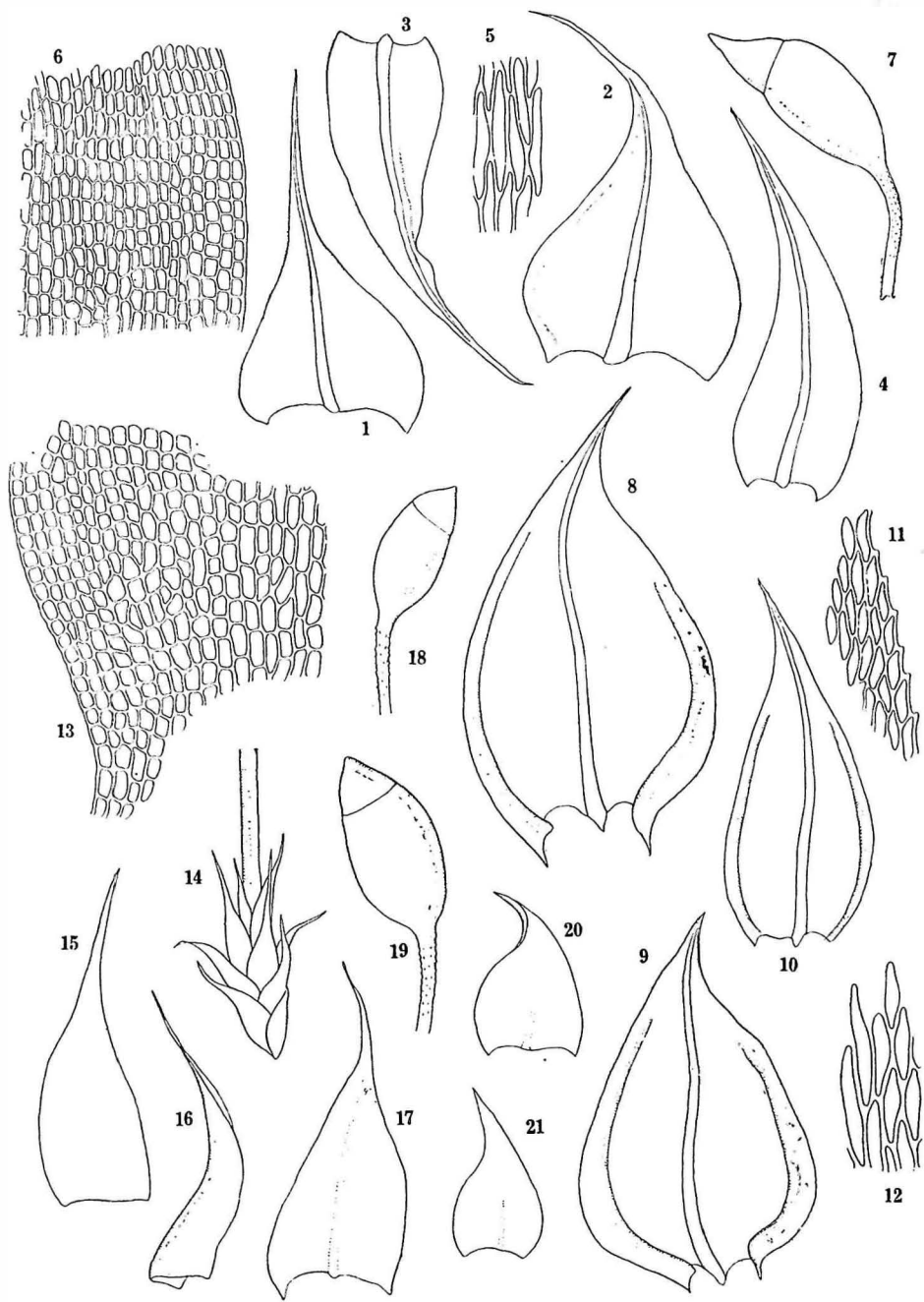


Fig. 30.

Plants ca. 2 cm high, forming loosely intricate, glossy yellowish green mats. Stems creeping or ascending, sending up subdividing branches, somewhat dendroid in form. Foliation dense and appressed when dry. Stem leaves broadly ovate-lanceolate, rather rapidly narrowing to the acumen, ca. 2.3×0.8 mm, irregularly and deeply plicate; margins nearly entire; costa stout, reaching apex; median leaf-cells minute, oblong-hexagonal, becoming shorter and wider towards the base, basal and alar cells more numerous, ovoid to quadrate, somewhat incrassate. Branch leaves similar to the stem leaves in many respects. Seta delicate, 12-13 mm, nearly smooth throughout. Capsules small, suberect, nearly symmetrical.

Specim. exam.: **Honshū**. Pref. Niigata: Nakakambara-gun *Ikeg.* 30244, Minamikambara-gun *Ikeg.* 12933, Kariwa-gun *Ikeg.* 29386, Kamo-shi *Ikeg.* 20160, Is. Sado *Ikeg.* 12380, Pref. Toyama: Kurobe valley *Tak.* 14634, 14750. Pref. Ishikawa: Hagui-gun *Ikeg.* 29294. Pref. Nagano: Kirigamine *Tak.* 719, 6394, Sugadaira *Tak.* 777, Mt. Shirouma *Tak.* 9439, Miwa-mura *Tak.* 800, 11708. Pref. Aichi: Mt. Ryūzu *Tak.* 7621, 7640. Pref. Kyōto: Kibune *Nak.* 849. **Korea**. Is. Quelpart *U.F.* 633 (orig. specim.).

Range: Japan (Honshū) and Korea.

The very plicate and very broad leaves with numerous quadrate basal cells are the most striking characters of this variety. Smoothness of seta is not constant, and not always combined with the characters mentioned above. Although this is considered a separate species by some authors, we can find many transitional forms between this and *populeum* when we examine a lot of specimens. The author considers it as a variety of *populeum*.

38 b) var. *japonicum* Dix. et Thér. (Fig. 29)

Brachythecium populeum var. *japonicum* Dix. et Thér. in *Rev. Bryol.* 4: 160 (1931); Sakurai, l.c. 138 (1954).

It forms dense, low (1.5 cm high), glossy golden yellow mats. Stems ascending, intricate, densely branching. Branches straight, 5-7 mm long, subdivided, showing somewhat dendroid form. Branch leaves strongly appressed when dry, resembling *Homalothecium laevisetum* in its aspects. Leaves oblong lanceolate, strongly concave, not plicate, margins strongly recurved except the acumen, nearly entire or minutely serrulate upper half. Seta nearly smooth throughout, 5-12 mm long.

Specim. exam.: **Honshū**. Pref. Yamagata: Tsuruoka *Nog.* 4210. Pref. Gumma: Oze *Mizs.* 5685. Pref. Toyama: Toyama-shi *Matsumoto* (orig. specim.). Pref. Shiga: Mt. Ibuki *Tak.* 16287. Pref. Tottori: Yazu-gun *H.O.* 891.

Range: Japan (Honshū).

Fig. 30.

1- 7. *Brachythecium populeum* var. *longisetum* Bryol. Eur. (*Tak.* 16292).

8-21. *B. cochlearifolium* Tak.

1, 2. Stem leaves ($\times 30$). 3, 4. Branch leaves ($\times 30$). 5. Median cells of stem leaf ($\times 340$). 6. Basal angle of stem leaf ($\times 155$). 7. Capsule ($\times 12$). 8, 9. Stem leaves ($\times 30$). 10. Branch leaf ($\times 30$). 11. Marginal part of stem leaf ($\times 218$). 12. Median cells of stem leaf ($\times 340$). 13. Basal angle of stem leaf ($\times 155$). 14. Perichaetium ($\times 13$). 15, 16, 17. Perichaetial bracts ($\times 30$). 18, 19. Capsules ($\times 12$). 20, 21. Perigonal bracts ($\times 30$).

It is allied to var. *quelpaertense* in its leaf form and smoothness of seta but differing in the strongly reflexed leaf margins. But an intermediate form is found frequently among the author's collections.

38 c) var. *yamamotoi* (Sakurai) Takaki stat. nov. (Fig. 29)

Brachythecium yamamotoi Sakurai in Bot. Mag. Tokyo 50: 370, f. 11 (1936); Musc. Jap. 138 (1954). Syn. nov.

This is a very delicate one, forming low and dense golden yellow mats. Both leaves of stem and of branch are very narrowly lanceolate with a long, filamentous and slender acumen, ca. 2×0.48 mm in stem leaves, 2.1×0.35 mm in branch leaves. Capsules also small, 1.0×0.6 mm. Seta thin and short 13–19 mm, rough above, smooth below.

Specim. exam.: **Hokkaidō**. Is. Rebun *Iwaz. & Tak. 15110*. **Honshū**. Pref. Aomori: Higashitsugaru-gun *Mizt. 6043*. Pref. Chiba: Mt. Mineoka *Asano 144*. Pref. Niigata: Nakakambara-gun *Ikeg. 12130*, Kitauonuma-gun *Ikeg. 35137*, Is. Sado *Ikeg. 548*. Pref. Shizuoka: Iwata-gun *Mizt. 482*. Pref. Mie: Ujiyamada *Mag. 1752*, Mt. Fujiwara *Tak. 13520*. Pref. Shiga: Mt. Hiei *Sak. 6059* (orig. specim.). **Shikoku**. Pref. Tokushima: Mt. Takatsu *Nog. 4043*. **Kyūshū**. Pref. Ōita: Mt. Kujū *Nog. 2919*.

Range: Japan (Hokkaidō, Honshū, Shikoku and Kyūshū).

This was described by Sakurai as a separate species, on account of the leaf form and the subpapillose leaf surface. But when we examine a large number of specimens many intermediate forms between *yamamotoi* and *populeum* are found. So, the author considers *yamamotoi* should be ranked as a variety of *populeum*.

38 d) var. *longisetum* Bryol. Eur. (Fig. 30)

Brachythecium populeum var. *longisetum* Bryol. Eur. fasc. 52–54, pl. 536 (1853); Sakurai, l.c. 138 (1954).

It has the delicate and longer seta attaining sometimes 3 cm in length. Moreover, the striking characters of this variety are those of the stem leaves: they are broadly cordate-ovate, their acumens narrow rapidly into long, falcate ones and their alar cells are quadrate and numerous.

Specim. exam.: **Honshū**. Pref. Saitama: Chichibu *Mizs. 1919*, Mt. Būkō *Ikeg. 20342*. Pref. Tōkyō Iruma-gun *Mizs. 6534*, Nishitama-gun *Mizs. 8155*. Pref. Niigata: Nakakambara-gun *Ikeg. 10268*, Minamikambara-gun *Ikeg. 22713*, Minamiuonuma-gun *Ikeg. 18128*, Is. Sado *Ikeg. 495*. Pref. Toyama: Kurobe *Tak. 14640, 14759*. Pref. Nagano: Sugadaira *Tak. 1329*, Mt. Kisoontake *Mizs. 7063*. Pref. Aichi: Mennoki pass *Tak. 10978*. Pref. Gifu: Mt. Ibuki *Nog. 4133, 4137*. Pref. Shiga: Samegai *Nak. 6224*. Pref. Mie: Mt. Ōdai *Tak. 6041*, Mt. Fujiwara *Tak. 13512*. Pref. Nara: Mt. Tōnomine *Nak. 3316*. Pref. Ōsaka: Ushitaki *Nak. 584*. Pref. Hyōgo: Mt. Futatabi *Tak. 7380*, Chikusa-mura *Nog. 26158*. Pref. Okayama: Maniwa-gun *Nog. 24159*, Atetsu-gun, Rashōmon *Nog. 20479, Tak. 6292*. Pref. Hiroshima: Hiba-gun *Nog. 24558*, Sandankyō *Nog. 8869, 9013*. Pref. Tottori: Mt. Daisen *Nog. 22178*. **Shikoku**. Pref. Ehime: Nii-gun *K.O. 693*, Mt. Ishizuchi *K.O. 3504*. **Kyūshū**. Pref. Fukuoka: Mt. Hōman *Nog. 7933*. Pref. Kumamoto: Kōnose *Tak. 2285*.

Range: as in the type.

Hab.: Occurs frequently in calcareous districts.

39. *Brachythecium cochlearifolium* Takaki sp. nov. (Fig. 30)

Autoicum. Planta mediocris, caespitosa, caespitibus densis, sordide-viridibus, haud nitidis, inferne fuscescentibus, mollibus. Caulis erectus, usque ad 1-2 cm altus, dense foliosus, irregulariter ramosus, ramis erectis vel ascendentibus, 1-1.5 cm longis, attenuatis. Folia sicca adpressa, humida erecto-patentia. Folia caulina valde concava, breviter decurrentia, late ovato-lanceolata, apice breve acuminata, ca. 2×1.2 mm, marginibus indistincte et minutissime serrulatis; e medio basin versus recurvis; nervo valido, infra apicem folii evanido; cellulis laminarum obscuris, anguste oblongo-hexagonis, $32-48 \times 5.8-7.3 \mu$, infimis laxioribus, alaribus quadratis, numerosis. Folia ramea e basi ovata sensim longe et acute acuminata, valde concava, 1.7×0.7 mm. Bractee perichaetii internae basi semivaginantae deltoido-ovatae sensim elongatum attenuatae, crenulatae, enerves. Seta 8-10 mm, rubra, superne scabra, inferne laevis. Theca inclinata, breviter oblonga, 1.5×1 mm, asymmetrica. Annulus? Exostomii dentes subulato-lanceolati, ca. 0.59 mm longi et basi 0.11 mm lati, linea media flexuosula, inferne lutei transverse striatuli, superne hyalini, papilloso, hyaline limbati, intus dense lamellosi; endostomium luteum papillosum; corona basilaris ca. 0.22 mm alta; processus carinati in carina late perforati; cilia 2. Operculum e basi conicum rostratum ca. 0.6 mm longum et 0.8 mm in diam.

Specim. exam. **Honshū**. Pref. Niigata: Kitauonuma-gun, Kawaguchi *Tak.* 16291—Holotype, leg. Y. Ikegami Nov. 19, 1947.

Range: Japan (Honshū).

This species closely resembles *B. populeum*. Both species have the leaves whose costa reaches the apex, and the seta which is rough above. But the former may easily be distinguished from the latter by the extremely concave and broadly ovate leaf with characteristic basal areolation consisting of numerous, small, quadrate cells.

SPORELING GERMINATION STUDIES IN MARCHANTIALES

IV. *Targionia hypophylla* L.

By P. KACHROO¹⁾

P. Kachroo: ゼニゴケ類の孢子発芽研究. 4. ハマグリゼニゴケ

Targionia belongs to the family Targioniaceae which also includes *Cyathodium* and *Aitchisoniella*. This family is either recognized (Cavers, 1911; Campbell, 1918; Verdoorn, 1932; Schiffner, 1938-39; Evans, 1939) or merged with the complex family Marchantiaceae (Kashyap, 1929; Frye & Clark, 1937).

Of the 3 species of *Targionia*, *T. hypophylla* L. is world wide in distribution. It is monoecious or dioecious and the thalli often bear ventral adventitious shoots. The life history is studied by Deutsch and O'Keefe (vide Campbell, 1939). Campbell (1918) reports polarity in the emergence of the first rhizoid and the germ papilla which comes out from the opposite end of the spore and that a two sided apical cell is present in the early stages of the sporeling development.

The spores of the species were collected from Mussoorie (5-7,000 ft.) in the last week of September, 1948 and Simla (5,000 ft.) in April, August and October, 1949. At both places it occurs on dry rocks. A collection was made from Cherrapunji in Feb. 1953. Germination was done on half strength Knop's solution and on soil.

Sporeling germination

The spores are dark brown, spherical, with a faint triradiate mark and the 3 usual spore coats. The perisporium is rather compact, yellowish-brown, with irregular and finely serrate margin and with irregular markings on the surface (Fig. 1, c). It is variable in thickness and often rolled inwards here and there. The exine possesses thinner reticulations enclosed within thicker larger pentagonal areas (Fig. 1, a, b). The latter are of variable thickness and area in various spores. It is not uncommon to find spores double the size of the normal spores in the same capsule (compare Fig. 2 a with same b, c). The size of the normal spores varies from 30-45 μ .

The spores do not require any rest period before germination, those collected on October 7, 1949 and sown on Oct. 14, 1949 germinated within a week, while those collected on Feb. 7, 1953 germinated within a fortnight. On germination the spore coat swells in size followed by rupture along the triradiate mark (Fig. 3) as in *Cyathodium tuberosum* Kash. to liberate the germ papilla and the first rhizoid, either from the same side or from the opposite ends (Fig. 4) or laterally (Fig. 6, 15). In certain instances the spore coat may later break up into a few smaller pieces along the thicker larger reticulations, giving the false impression of irregular rupture (Fig. 4). In such cases it is clear that the polarity reported by Campbell (1918) is absent. A rhizoid is nearly always formed simultaneously

1) Ast. Botanist, D.V.C., Burdwan, India.

with the germ tube. Rarely the germ cell may form two rhizoids (Fig. 5). Occasionally its formation is suppressed even up to the formation of the germ disc (Fig. 10). The germ tube formation is as common as its suppression.

Early stages of germination are very irregular but on the whole these are similar to those described for *Reboulia* (Mehra & Kachroo, 1951), particularly the *Reboulia-Plagiochasma* alliance. The germ papilla is full of chloroplasts and some oil globules. With its elongation into a germ tube the majority of the chloroplasts shift to the apical region and the basal region is left with only a parietal layer of the same, with some others dispersed in the central cavity. Later, however, they are completely wanting in the basal region of the germ tube. The first wall is transverse followed by 2-3 similar walls to form a germ filament 3-4 cells long (Fig. 6). A vertical wall appears later in the terminal cell (Fig. 7) and this marks the initiation of plate formation (Figs. 8-10). Occasionally in the two cell filament vertical walls may appear in both the cells accompanied by a transverse wall in one of the apical cells and an oblique one in the basal cell.

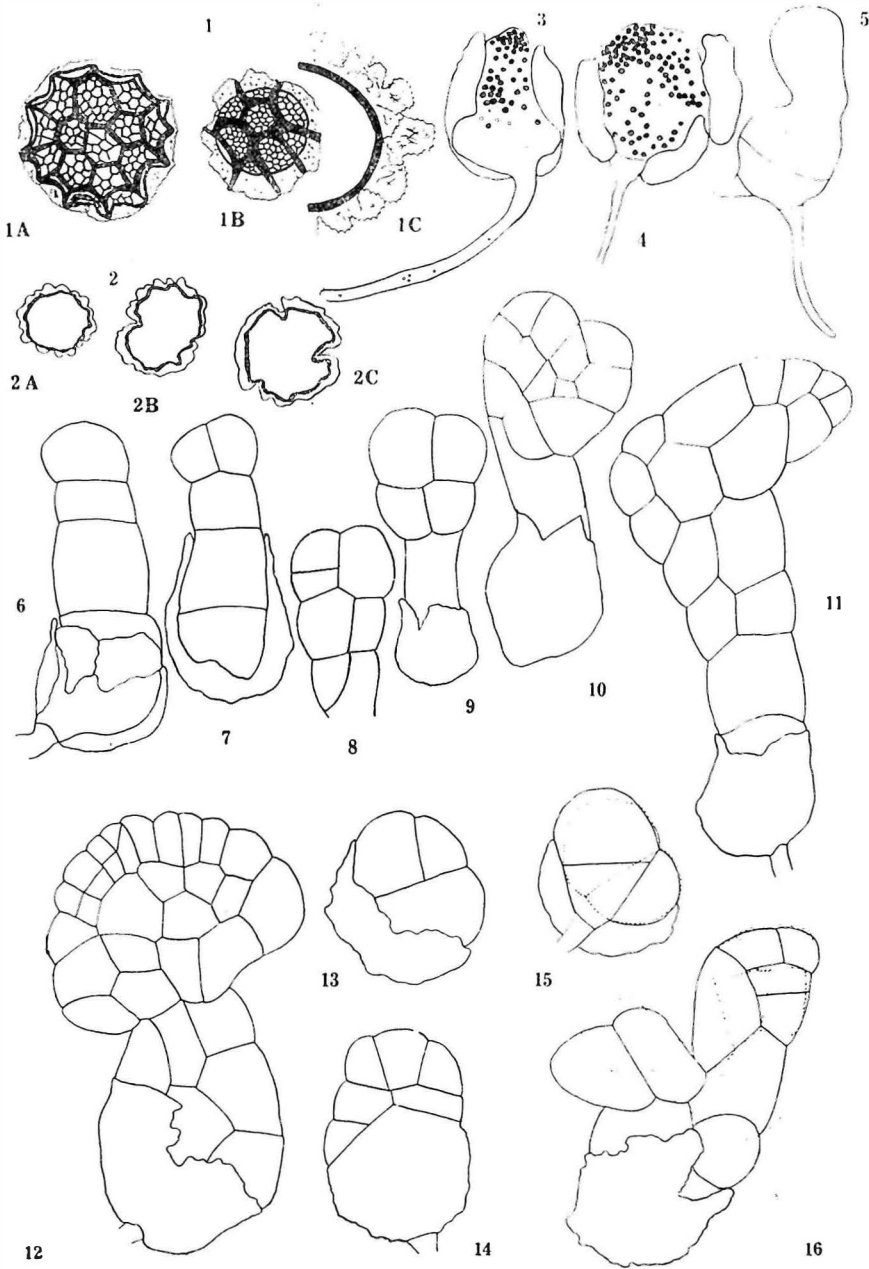
The germ plate shows a generalised apical growth and grows in continuation of the germ tube axis. This is followed by a plagiotropic germ disc of the *Reboulia* type (Figs. 11, 12).

Occasionally the germ tube formation is suppressed and the germ cell becomes cellular (Figs. 13, 14). They show some indication of the presence of an apical cell with two cutting faces (Fig. 13) in their early stages. Rarely the two cell stage may become two layered to form a plate earlier (Fig. 15).

In the germ disc later the meristematic activity becomes confined to a lateral position and here develops a wedge-shaped apical cell which controls the further growth of the thallus and becomes lodged within the notch due to the growth of the surrounding tissue.

It is not uncommon to observe the formation of 2-3 germ tubes due to the formation of vertical walls in the germ cell as in *Plagiochasma*, *Asterella* (Mehra & Kachroo, 1951) and *Athalamia* (Unpubl. data). In such instances the germ tube growing towards illumination shows precocious growth and attains maturity earlier than the one away from light (Fig. 16). In cases where three germ tubes are formed the rhizoid formation is usually limited to one. Under unfavourable conditions one of the germ tubes, usually growing away from light, develops a secondary germ tube which on coming in contact with illumination develops a plate in the usual way.

Formation of secondary filamentous germ tubes in feeble illumination and excessive moisture are as common as in *Reboulia*. Sporelings growing submersed show abnormal structure and a condition of extreme weakness. They always show a clear triradiate rupture and great enlargement of the germ cell. In certain instances the germ tubes either enlarge enormously or become pear-shaped showing the presence of a few transverse walls at the apex, or become club-shaped or broad with a middle constriction or balloon shaped. Chloroplasts are scanty, yellowish and colourless. The nuclei show less staining capacity. Such sporelings do not develop further and die within 2-3 months.



Figs. 1-16. Various stages in sporeling germination in *T. hypophylla*.
Fig. 1, $\times 425$. Rest, $\times 325$. (For explanation see text).

Discussion

The union of *Targionia* and *Cyathodium* under Targioniaceae has been proposed by Lang (1905), Leitgeb (1881) and Cavers (1911). Campbell (1918, 39), Tiwari (1935) and Chavan (1937) justify the same on the basis of spore germination. Schiffner (1938-39) first questioned their union on the nature of the origin of the female receptacle. Muller (vide Proskauer, 1951) places them in different families: Targioniaceae and Cyathodiaceae. Kashyap (1929) does not recognize the individuality of the family but places *Targionia* later to *Cyathodium* in his family Marchantiaceae. In a recent paper on *Cyathodium* Proskauer (1951) discusses the previous points of view and brings the two genera close together. He regards '*Cyathodium* as a reduced form derived from a form not unlike *Targionia*.'

The present studies reveal much divergence in the structure of spores of the two genera: three coated, brown, with a characteristic perispore and with an exine bearing smaller reticulations enclosed within larger thicker pentagonal areas in *Targionia* and black two coated with exine showing smaller thick spines in *Cyathodium tuberosum* and *C. africanum* or brown with a reticulum of raised ridges in *C. spruceanum*. *T. hypophylla* shows the rupture of the spore along the triradiate mark as in *C. tuberosum* and does not show any polarity with respect to the emergence of germ papilla and the rhizoid as also in *C. kashyapii* (Khanna, 1934): in contrast to the observations of Campbell (1918) on *Targionia*, Tiwari (1935) and Chavan (1937) on *Cyathodium* (in *Cyathodium* the triradiate mark is very faint and can be brought out in spores placed in unfavourable moisture and illumination conditions for a long time). In the behaviour of germination and the nature of germ disc *Targionia* follows very closely the *Reboulia* plan. In the early stages of development the growth is apical and due to the division of all the marginal cells in the apical region as in other Marchantiales and when the germ disc attains a considerable size the meristem becomes localised to one of the sides and later a four sided apical cell differentiates here. In *Cyathodium* neither Tiwari nor Chavan describe the presence of such a disc but report the presence of an apical cell with two cutting faces in the early stages.

It, thus, appears that the two genera differ markedly in spore structure but agree to some extent in general plan of germination. These facts when taken together with other morphological features do not suggest a too close relationship between the two. But whereas their union under Targioniaceae may be convenient this study does not support the suggestion that *Cyathodium* could have evolved from a form like *Targionia*. The presence of sub-involucral archegonia common to both has been given much prominence and evolved much discussion. It signifies that both have a common group of ancestors and have undergone parallel evolution.

Summary

T. hypophylla has spores with a characteristic perispore: compact and with thickened surface, exine with smaller reticulations enclosed within larger pentagonal areas. The rupture is along triradiate mark and there is no polarity with respect to the emergence of the first rhizoid and the germ papilla. The germ disc is of the *Reboulia* type and behaves in a similar manner. A suggestion for non-inclusion of *Targionia* and *Cyathodium* in a single family is given.

This study together with previous communications (Mehra & Kachroo, 1951, 52; Kachroo, 1955) was undertaken on advice of Prof. P. N. Mehra to whom I am deeply indebted for his untiring interest and encouragement. I am grateful to Prof. W. C. Steere for kindly going through this note.

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HEPATICAЕ OF HOKKAIDŌ. I. ON THE HEPATICAЕ OF
SOUTHERN HIDAKA, WITH SPECIAL REFERENCE
TO THE HEPATICAЕ OCCURRING ON
SERPENTINE ON MT. APOI

By Sinske HATTORI¹⁾

服部新佐：北海道の苔類²⁾。I. 日高南部の苔類，特にアポイ山蛇紋岩地の苔類について

Hokkaidō is the northernmost one of the four main islands of Japan, extending about 45°30'~44°30' N. Lat., 140°~145°E. Long., and comprises ten provinces. The province of Hidaka is situated to the south, reaching the Erimo Peninsula on the southernmost point. The present area, "Southern Hidaka", is here arbitrarily taken to comprise the southern part of the province, south of about 42°15'N. Lat. In last summer, Mr. D. Shimizu made a trip to Hokkaidō with a view to collecting mosses and liverworts for the writer. The hepaticae then collected in the area mentioned amount to 400 packets, in which 88 species have been identified. Among them 1 species is a new addition to the Japanese flora, 15 genera and 41 species have not been reported previously from the hepatic flora of Hokkaidō, further, 4 species and 3 varieties are new to science (and will be described elsewhere). The result shows that the hepaticae of Hokkaidō have hitherto been very imperfectly explored.

Since the underlying rocks often play an important rôle on the nature of flora, it is felt that a short remark on the petrography as well as the physical features, seems to be necessary to understand the present flora. The present area is mostly covered by the southernmost part of the Hidaka mountain range. None of these peaks are, however, higher than 1000 m. The highest peak botanized this time is Mt. Apoi which attains an altitude of 810 m. above sea level. The Hidaka Mts. are composed of mica-schist, gneiss, paleozoic rocks, and basic and ultrabasic intrusive rocks for the most part. The limestone outcrop is only seen at Esamanbetsu on a small scale. Along coast near Samani and at the tip of Erimo Pen. tertiary rocks are found. However, as shown by the bold lines in the inserted map, Mr. Shimizu's researching course was focused to Mt. Apoi where the most extensive collection was made. Mt. Apoi consists mostly of serpentine. As bryological research of serpentine area seems to have been far from a satisfactory one, a stress in this paper will be put on this point.

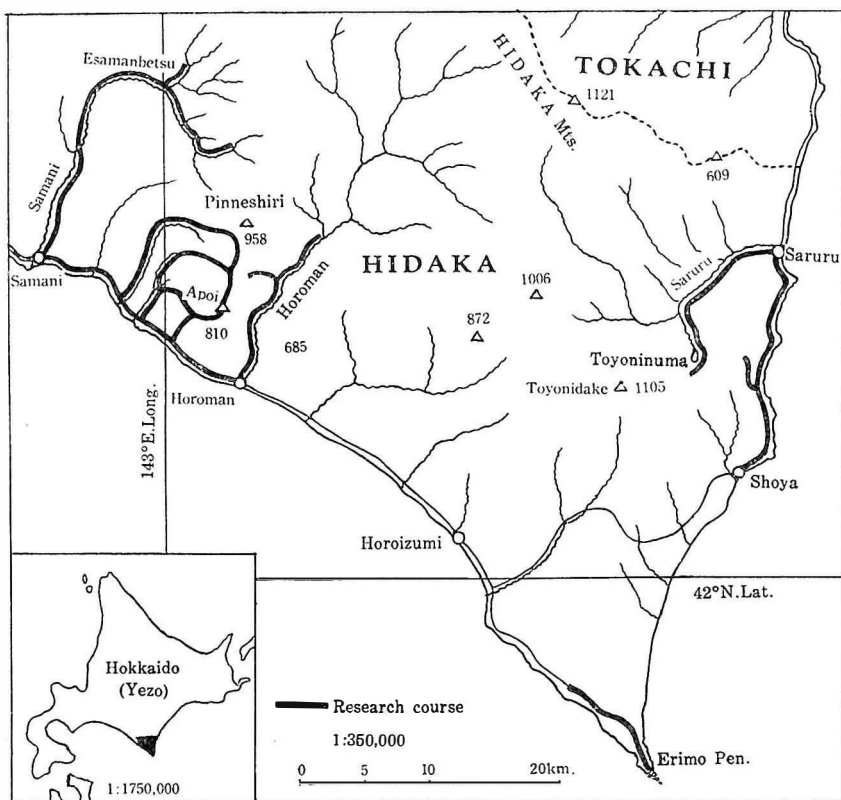
The chemical composition of the substratum is of great importance in delimiting the nature of the hepatic flora. As pointed out by A. Noguchi and many others, certain species are decidedly limited to calcareous area and appear to have a definite affinity for calcium. All the hepaticae collected in the present area may be divided roughly into the following four major groups according to their substrata.

1) The hepaticae occurring on serpentine.

In our area twenty-seven species are found on serpentine. Sixteen species of

1) Hattori Botanical Laboratory

2) 本研究は文部省科学研究費交付金に依る



them also occur on other substrata, but none on limestone. The remaining eleven species, *Barbilophozia barbata*, *Cololejeunea nakajimae*, *C. rupicola* fo. *minor*, *Eus-molejeunea auriculata*, *E. obtusifolia*, *Frullania densiloba*, *Jubula hutchinsiae* subsp. *japonica*, *Nipponolejeunea pilifera*, *Radula amentulcsa*, *R. boryana*, and *R. kane-marui*, are confined to serpentine in our area.

However, they are not always confined to the serpentine area: in many other regions they have already been known to occur on many kinds of substrata. For example, *Barbilophozia barbata* occurs on various rocks in Europe and North America, although in Japan it was discovered on serpentine now for the first time. It is well known that many plants are generally known to occur on a certain substratum, such as limestone, at the border or peripheral zone of their geographical areas. The remaining ten species are mostly endemic in Japan or her adjacent regions and of southern origin. The center of their areas seems to be Middle~Southern Japan, where they occur on living leaves of tree, shrubs and ferns, bark of trees, many kinds of rocks (such as granite, andesite, chert, clay-slate, sandstone, etc.) and soil or thin humus covering the rocks.

From the phytogeographical point of view, the twenty-seven hepaticae occurring on serpentine in our area may be divided roughly into the following two groups: (a) Fifteen species also occurring in common with the adjacent areas (Hok-

kaidō and northern Honshū).—*Bazzania ovalifolia* var. *vastifolia*, *B. trilobata*, *Blepharostoma minus*, *Bl. trichophyllum*, *Diplophyllum taxifolium*, *Frullania jackii*, *Fr. moniliata* subsp. *obscura*, *Jamesoniella autumnalis*, *Jubula hutchinsiae* subsp. *japonica*, *Macrodidiplophyllum plicatum*, *Metzgeria conjugata* var. *japonica*, *Plagiochila satoi*, *Plectocolea prostrata*, *Radula amentulosa* and *R. obtusiloba* belong hereto. More than half of them are also distributed in Europe, Siberia and North America. Further, these fifteen species mostly are common species in Northern Japan, and occur on various kinds of substrata in our area as well as in other regions. (b) Twelve species known nowhere else so far in Hokkaidō. —*Barbilophozia barbata*, *Cololejeunea nakajimae*, *C. rupicola* fo. *minor*, *Euosmolejeunea auriculata*, *E. obtusifolia*, *Frullania densiloba*, *Herberta sakuraii*, *Lejeunea rotundistipula*, *Nipponolejeunea pilifera*, *Radula boryana*, *R. kanemaru* and *Trichocoleopsis sacculata* belong to this group. It is most remarkable that all except three species, *Herberta sakuraii*, *Lejeunea rotundistipula* and *Trichocoleopsis sacculata*, are confined only to one substratum, serpentine, in our area. As already mentioned, except *Barbilophozia barbata*, almost all of them are endemic to Japan and its neighbouring regions, and they are of subtropic or temperate element. Thus, their occurrence in the present area may mostly be regarded as a disjunctive distribution.

In the serpentine area of Mt. Apoi, *Bazzania ovalifolia* var. *vastifolia*, *B. trilobata*, *Blepharostoma minus*, *Diplophyllum taxifolium*, **Euosmolejeunea auriculata*, **E. obtusifolia*, *Frullania moniliata* subsp. *obscura*, **Herberta sakuraii*, *Macrodidiplophyllum plicatum*, **Plagiochila satoi*, **Radula amentulosa*, and *R. obtusiloba* are those most commonly found, in which the species marked with an asterisk (*), especially *Euosmolejeunea obtusifolia*, as well as rare species such as *Frullania densiloba*, *Nipponolejeunea pilifera*, *Radula boryana* and *R. kanemaru*, may well exhibit the characteristic feature of the Northern Japanese serpentine hepatic flora, together with the distinct fact that all calcicolous hepaticae and many other saxicolous ones occurring in the adjacent non-serpentine areas are very scarce or often entirely lacking herein; for examples, such genera as *Calypogeia*, *Conocephalum*, *Pellia*, *Plagioglossum*, *Porella*, *Scapania*, *Solenostoma* and others, lacks or are very poorly represented.

So far as the present area is concerned, there are no essential serpentine hepaticae, that is those confined to serpentine rocks. The hepaticae occurring on serpentine on Mt. Apoi seem not to be serpentine-loving or to have positive preference to serpentine, but to be more tolerant of excess of magnesium than other hepaticae do.

2) The hepaticae occurring on limestone.

At Esamanbetsu, about 10 km. north of Mt. Apoi, there is a small outcrop of limestone along the Samani rivulet. Here, fourteen species of hepaticae were collected on limestone. Among them, eight species were collected also on other rocks, such as gneiss, black slate, graywacke, but never on serpentine. The remaining six species, *Acrobolbus mayebarae*, *Athalamia* sp., *Porella gracillima*, *P. setigera*, *Plagioglossum* sp. (*intermedium*?), and *Solenostoma exsertifolium*, are restricted only to limestone in the present area. These six species are generally endemic and confined to limestone (or otherwise calcium containing soil) in Japan. Thus,

they may be regarded as real calciphile hepaticae, in which, however, we should possibly permit the intermixture of such hepaticae as those localized in the calcareous area, because they may have been extinct in other areas.

It is a most remarkable fact that any species do not occur on both limestone and serpentine, although most of them occur also on many other substrata. The chief reason why calciphile hepaticae do not occur on serpentine may possibly be that they have very weak tolerance for magnesium content. The pH difference between the chalk- and serpentine-loving hepaticae is not so great: pH 7~8 in the former, pH 6.5~7 in the latter.

3) The hepaticae occurring on trees and humus.

Thirty-two species occur on trees and humus. Among them fourteen species, however, also occur on rocks: two species occur on serpentine, one species on limestone, four species on serpentine and other rocks than limestone, two species on limestone and other rocks than serpentine, and five species on various rocks other than serpentine and limestone. The remaining eighteen species do not occur on rocks. They are: *Anastrophyllum japonicum*, *Cephalozia hakkodensis*, *C. media*, *C. nipponica*, *Harpanthus scutatus*, *Lepidozia reptans*, *Lophocolea heterophylla*, *L. integristipula*, *Lophozia incisa*, *Moerckia erimona*, *Mylia verrucosa*, *Nipponolejeunea subalpina*, *Odontoschisma denudatum*, *Ptilidium pulcherrimum*, *Scapania parvitexta*, *Tritomaria exsecta*, *Riccardia japonica*, and *Scapania spinosa*. In them, *Nipponolejeunea subalpina* and *Ptilidium pulcherrimum* occur on bark of trees (especially of *Pinus pumila* in our area). But the others usually prefer decayed wood, some of which also occur on rocks elsewhere.

4) The hepaticae occurring on different substrata.

Among eighty-eight species collected in the present area, eleven species are restricted to serpentine, six to limestone, twelve to decayed wood, and two restricted to the bark of trees (mostly of *Pinus pumila*). The remaining fifty-seven species, however, occur on two or more kinds of substrata. *Frullania moniliata* subsp. *obscura*, one of the commonest species in the present area, occurs on serpentine (mostly), quartz-porphry, black slate, graywacke, bark of *Picea*, *Abies*, *Pinus*, *Ulmus*, etc. or their bases, soil and grassy bank. *Bazzania ovifolia* var. *vastifolia* occurs on serpentine, quartz-porphry, graywacke, soil, humus, decayed wood, and tree trunks and bases. *Diplophyllum taxifolium* occurs on serpentine, graywacke, decayed wood, humus (and humus including soil), and bases of trees. *Radula obtusiloba* occurs on serpentine, conglomerate, graywacke, and gneiss. Further, *Macrodiplophyllum plicatum* occurs on serpentine, quartz-porphry, *Abies* trunks, and among grasses. These species have a wide ecological amplitude and represent the commonest members in our area.

The hepatic flora of the present area is comparatively poor. Most of the eighty-eight species recognized in our area are also distributed in the other areas of Hokkaidō. While, the present area lacks many hepaticae which are rather commonly found in Hokkaidō, such as *Marsipella*, *Gymnomitrium* and other arctic genera, *Diplophyllum albicans*, *Bazzania fissifolia*, *Radula complanata*, and many species of *Lophozia* and *Scapania*, possibly because of lacking high peaks, bogs

and peats, and asidic rocks such as granite and andesite as their substrata. However, the present flora exhibits a remarkable feature by the disjunctive occurrence of many southern hepaticae. Most of them occur on serpentine area of Mt. Apoi, and yet nearly half of which are confined to serpentine. Further, there are a few calciphilous species on small limestone outcrop at Esamanbetsu, which also show disjunctive distribution.

Here the writer wishes to express deep gratitudes to Mr. D. Shimizu who collected hepaticae dealt in this paper, and also to Mr. T. Amakawa for determining or verifying some difficult members of *Solenostoma* and *Cephalozia*.

Enumeration of species

So far as the writer has been able to ascertain, the species marked with an asterisk (*) have not been recorded previously in the Island of Hokkaidō.

Ord. ANTHOCEROTALES—Fam. ANTHOCEROTACEAE

Phaeoceros laevis (L.) Proskauer Syn. *Anthoceros laevis* L. —Soil bank along brooklet, with *Conocephalum supradecompositum* and *Plectocolea prostrata*, ca 50 m, Erimo Pen., 55140. —On hornfels and black slate, 5~30 m, along coast between Saruru and Shōya, 54896, 54902.

Ord. MARCHANTIALES—Fam. MARCHANTIACEAE

* *Marchantia paleacea* Bertoloni Syn. *M. diptera* Mont. —On black slate, ca 250 m, Esamanbetsu, 22517, 54928, 54934, 55650. —On chert, 5~10 m, along coast near Samani, 54621, 55657. —*M. diptera* should be regarded as a variety of *M. paleacea*.

Marchantia polymorpha L. —On exposed, wetty hornfels, 5~30 m, along brooklet near coast, between Saruru and Shōya, 54904.

Conocephalum conicum (L.) Dum. —On humus covered bases of trees, occurring with *Moerckia erimona* and *Pellia neesiana*, 150 m, near Horoman, 54623. —On shady limestones, 250 m, Esamanbetsu, 22510, 22554. —On semishaded, wetty soil, along stream, with *Geocalyx lancistipulus* and *Plectocolea prostrata*, 40~60 m, Erimo Pen., 55149. —On clayey soil in shade, with *Calypogeia tosana* and *Riccardia shimizuana*, ca 400 m, side of Toyoninuma, 54880. —On hornfels, with *Blepharostoma minus*, 5~30 m, along coast near Saruru, 54890. —On chert, with *Plectocolea* sp., 60 m, near Horoman, 54625. —In the present area this species frequently occurs on hornfels and other rocks along coast, and also is not rare in lower montane regions such as along the Apoi Valley.

Conocephalum supradecompositum (Lindb.) Steph. —On graywacke, with *Plectocolea* sp., 5~30 m, along coast between Saruru and Shōya, 54901. —Side of stream, exposed but damp soil, with *Geocalyx lancistipulus*, *Plectocolea prostrata* or *Phaeoceros laevis*, ca 50 m, Erimo Pen., 55140, 55149, 55150. —In the present area, this is not uncommon on clay-slate, graywacke and other rocks along the coastal lowland, but does not occur on serpentine.

Fam. REBOULIACEAE

Reboulia hemisphaerica Raddi —On limestones, 250 m, Esamanbetsu, 55129.

--On graywacke and diabase, ca 400 m, along the Horoman river, 54626, 54628.
 --On humus covered conglomerate, 5~10 m, along coast near Samani, 54631.
 --On hornfels and soil, 80 m, along coast near Saruru, 54893. --Not rare along the coastal lowland.

Mannia sp. (Material sterile). Possibly *M. (Neesiella) longipes* or its allies. --On black slate, 250 m, Esamanbetsu, 55125. --On **limestone** exposed or covered with thin humus, 250 m, Esamanbetsu, 55098, 55108, 55128.

Plagiochasma sp. (Material sterile) Possibly *P. intermedium* Lindenb. et Gott. --On **limestone**, 250~280 m, Esamanbetsu, 54116, 54942, 55090, 55107, 55109-10, 55126-7. --The pH value of 55110 is 7.1~7.6. --The genus *Plagiochasma* is a new addition to the flora of Hokkaidō.

Fam. SAUTERIACEAE

Athalamia sp. (Material sterile) --On **limestone**, 250 m, Esamanbetsu. Rare. --The genus *Athalamia* is a new addition to the hepatic flora of Hokkaidō.

Fam. RICCIACEAE

* **Riccia glauca** L. --On damp soil, with *Riccia huebeneriana*, *R. sorocarpa*, 40m, at the foot of Mt. Apoi, 54607-54611. --The genus *Riccia* is a new addition to the hepatic flora of Hokkaidō.

* **Riccia huebeneriana** Lindenb. --At the same habitat as the preceding species; 54068-9.

* **Riccia sorocarpa** Bischoff --At the same habitat as the preceding two species; 54609.

Ord. METZGERIALES--Fam. METZGERIACEAE

Metzgeria conjugata Lindb. var. **japonica** Hatt., var. nov. Syn. *M. conjugata* Auct., -quoad plant. Japon.; *M. himalayensis* Hatt. (non Kashyap). --A typo recedit: cellulis corticalibus 4, raro 5, 6 (antice 2 et postice 2, raro 3, 4). --On **serpentine** ledges and cliffs, with *Macrodictyophyllum plicatum*, or occasionally with *Radula obtusiloba*, *Euosmolejeunea auriculata*, *E. obtusifolia*, *Plagiochila satoi*, *Frullania moniliata* subsp. *obscura*, *Herberta sakuraii*, from 550 m alt. to top of Mt. Apoi, 54642, 54665, 54709, 54737, 54785, 54822, 54842; with *Jubula japonica*, *Blepharostoma minus* or *Plagiochila* sp., 150 m, along the Horoman river, 54616. --On gneiss, with *Radula obtusiloba*, *Porella grandiloba* or *P. vernicosa* var. *sasakii*, ca. 400 m, near Toyoninuma, 54854-5. --On graywacke, with *Bazzania ovifolia* var. *vastifolia*, *Radula japonica* or *Plagiochila* sp., or occasionally with *Diplophyllum taxifolium*, ca 400 m, near Toyoninuma, 54875, 54877. --The pH value of 54854 is 6.5.

Metzgeria pubescens (Schrank) Raddi Syn. *M. duricosta* Steph., Spec. Hepat. 6: 50 (1917), syn. nov.--vidi typum. --On **limestones**, with *Porella grandiloba*, 250 m, Esamanbetsu, 55124. --On *Cercidiphyllum japonicum*, with *Porella grandiloba*, 200 m, Esamanbetsu, 22534. --The above-mentioned two *Metzgerias* usually grow among (or creep on) other mosses and hepaticae.

Fam. RICCARDIACEAE

Riccardia japonica Hatt. (msc.) --On rotten logs in damp, shady places, with

Cephalozia nipponica, *Odontoschisma denudatum*, *Scapania spinosa* and *Lepidozia reptans*, 400 m, Mt. Apoi, 54718-type. —The plant is quite similar to *R. miyakeana* Schiffn., but is monoecious.

Riccardia shimizuana Hatt. (msc.) —On clayey soil in moist, shady places, with *Calypogeia tosana* and *Conocephalum conicum*, 400 m, near Toyoninuma, 54880-type. —The present species is monoecious and closely related to *R. stephanii* Hatt. (= *Aneura crenulata* Steph.; not *R. crenulata* Schiffn.).

Fam. PELLIAACEAE

Pellia fabbroniana Raddi —Submerged in stream, 250 m, Esamanbetsu, 55117.

Pellia neesiana (Gott.) Limpr. —On banks by brooklet, ca 50 m above sea, Erimo Pen., 55143. —On humus~soil, 250 m, Toyoninuma, 54866. —On clayey soil, at the coast near Samani, 54620; pH 6.7.

Fam. PALLAVICINIACEAE

Moerckia erimona (Steph.) Hatt. —On humus covered tree bases and roots, with *Pellia neesiana*, *Conocephalum conicum*, 150 m, near Horoman, 54623.

Fam. FOSSOMBRONIAACEAE

Fossombronia sp. (Sterile material) —On soil, ca 40 m above sea, near Samani, 55152. —The present genus is newly added to the flora of Hokkaidō.

Ord. JUNGERMANNIALES—Subord. PTILIDIINEAE—Fam. HERBERTACEAE

* *Herberta sakuraii* (Warnst.) Hatt. Syn. *Schisma pusillum* Steph.; *H. pusilla* Hatt.; *H. remotiusculifolia* Horikawa; *H. minor* Horikawa; *H. minima* Horikawa. —On serpentine cliffs and rocks, with *Macrodiplophyllum plicatum*, occasionally with *Radula amentulosa*, *Diplophyllum taxifolium* or *Plagiochila satoi*, summit area of Mt. Apoi, 700~810 m, 54645, 54655, 54657, 54667, 54671-2, 54713, 54807. —Among grasses, serpentine area, with *Macrodiplophyllum plicatum*, *Radula amentulosa*, ca 700 m, Mt. Apoi, 54669. —On quartz-porphry, with *Macrodiplophyllum plicatum*, 400~550 m, Mt. Pinneshiri, 54758, 54760. —Very variable. Closely related to and possibly conspecific with *H. tenuis* Evs. and/or *H. hutchinsiae* (Gott.) Evs. —The genus *Herberta* is new to Hokkaidō.

Fam. PTILIDIACEAE

Ptilidium pulcherrimum (Web.) Hampe —On *Pinus pumila* bark, occasionally with *Nipponolejeunea subalpina*, summit of Mt. Apoi, 54646, 54651-2, 54661, 54668, 54693-4, 54697, 54706, 54708, 54784, 54789, 54794, 54797, 54799, 54813, 54819, 54823, 54829, 54834, 54837, 54839. —On *Betula apoiensis* and on *B. ermani* var. *commutata*, summit area of Mt. Apoi, 54796, 54804.

* *Trichocoleopsis sacculata* (Steph.) Okamura —On serpentine gravels, among grasses, *Selaginella* and larger mosses, 700 m, Mt. Apoi, 54633. —Crevices of graywacke, 200~250 m, along rivulet west side of Mt. Apoi, 54773, 54777. —On graywacke in shade, 500 m, near Toyoninuma, 54856, 54860. —Recently, in his studies of the geographical range of Japanese bryophytes, Horikawa (in Bull. Soc. Pl. Ecol. 2: 16, fig. 2. 1952) stated that this species reaches at Mt. Hakkōda (N.

Honshū) to the northernmost limit of its range. However, the present localities are about 270 km. to north-east of the Hakkōda mountains, and are the first record of the occurrence in Hokkaidō for this interesting monotypic genus.

Blepharostoma minus Horikawa (sphalm. minor). Syn. *B. japonica* Hatt. et Kuwahara. —On **serpentine**, 400 m to top of Mt. Apoi, with *Lejeunea rotundistipula*, *Radula obtusiloba*, *Plagiochila satoi* or *Diplophyllum taxifolium*, or rarely with *Euosmolejeunea obtusifolia*, *Cololejeunea shikokiana* or *Bazzania ovifolia* var. *vastifolia*, 54724, 54725, 54634, 54656, 54730-1, 54739. —Crevices of serpentine, with *Jubula japonica*, *Metzgeria conjugata* var. *japonica* and *Plagiochila* sp., ca 150 m, along Horoman, 54616. —Hornfels crevices, with *Conocephalum conicum*, 5~30 m, at the coast near Saruru, 54890. —Among grasses of serpentine area, summit of Mt. Apoi, with *Calypogeia tosana* and *Plectocolea prostrata*, 54638. —The pH value of 54739 is 6.6. —In Hokkaidō the present species usually occurs at lower altitudes. But in the present area, it ascends up to the summit of Mt. Apoi (810 m) where *Bl. trichophyllum* also occurs. While in the island of Rebunshiri, which is of andesite and lies near the northernmost of Hokkaidō, the present species descends towards the coast.

Blepharostoma trichophyllum (L.) Dum. —On **serpentine**, summit area of Mt. Apoi (700~810 m), with *Radula obtusiloba*, *Diplophyllum taxifolium* or with *Plagiochila satoi*, 54670, 54827. —On decaying log, with *Jamesoniella autumnalis*, *Lophocolea heterophylla* and *Cephalozia* sp., ca 300 m, Toyoninuma, 54869.

Fam. LOPHOCOLEACEAE

Lophocolea heterophylla (Schrader.) Dum. Syn. *L. angustiflora* Steph.; *L. fissicalyx* Steph. —On decayed wood, often with *Blepharostoma trichophyllum*, *Cephalozia* sp., *Jamesoniella autumnalis*, 300~400 m, near Toyoninuma, 54853, 54869, 54878. —It is remarkable that *L. minor* N. was not found in the present area.

* ***Lophocolea integristipula*** Steph. Syn. *L. japonica* Steph.; *L. koyasana* Steph. —On decayed wood, often with *Pedinophyllum pyrenaicum* (var. *interruptum*), 200~250 m, Esamanbetsu, 54916, 54943.

Chiloscyphus polyanthus (L.) Cda. —Wetty crevices of graywacke, 5~30 m above sea, near Saruru, 54908. —On graywacke in stream, 80~100 m, near Saruru, 54888-9. —On clay-slate and graywacke, in or side of stream, 300 m, near Toyoninuma, 54874, 54876.

Fam. LOPHOZIACEAE

* ***Barbilophozia barbata*** (Schmid.) Loeske in Verh. Bot. Ver. Brandenb. 49:37 (1907); —K. Müll. in Rabenh., Krypt.-Fl., 6 Bd., 3 Aufl., p. 635, Fig. 191 (1954); —Schuster in Amer. Midl. Naturalist 49-2: 328, Pl. 5: 1-8 (1953) as Subgen. Syn. *Jungermannia barbata* Schmid., Icon. Plant. 187 (1760). —*Lophozia barbata* Du Mort., Rec. d'obs. 17 (1835). —*J. schreberi* Nees in G., L. & N., Syn. Hepat. 125 (1844). —*L. schreberi* Boulay, Musc. de la France (1904).

On **serpentine**, summit area of Mt. Apoi (810 m), occurring with *Cladonia*, 54787, 54791; pH 6.5~7. —This species is a new addition to the hepatic flora of Japan. The author have examined about two thousand specimens of hepaticae

from many localities in Hokkaidō, but have not found this species so far elsewhere. According to K. Müller (1954), the present species grows “Auf Silikat- und Kalkfelsen, an Blockmauern, Wegrändern in grossen, braungrünen Rasen” in Europe. R.M. Schuster (1953) says, “It is a very abundant species,... It has a wide ecological amplitude: occurring on loamy or rocky banks, on thinly soil-covered rocks, or almost as a pioneer on dry or moist rocks. The species has a wide tolerance as far as the pH of the substrate goes: it may occur under quite acid conditions on humus, but is more often common under more nearly circumneutral conditions, with the pH from 5.8~6.5. When the pH gets above 6.5 the species begins to drop out.” The present area seems to be a border of the geographical range, where this species becomes to have a very narrow ecological amplitude. In our area, it has been collected on serpentine only, the pH measured being 6.5~7.0! The present species is known in Europe (Portugal on the south), Siberia (64° N. on the south), Greenland and N. America (New Mexico on the south). —The genus *Barbilophozia* is new to the flora of Hokkaidō.

* *Lophozia incisa* (Schrader) Dum. —On decayed wood, occurring with *Cephalozia hakkodensis*, *Mylia* sp., *Riccardia*, 450 m, Mt. Pinneshiri, 54761. —In the present serpentine area, *Barbilophozia* seems to be the only one which represents the epipetrious Lophoziaaceae.

* *Anastrophyllum japonicum* Steph. Syn. *A. tamurae* Steph. —On trunks and bases of *Picea* and *Abies*, 400~550 m, Mt. Pinneshiri, 54740, 54752, 54744. —Occurring with *Macrodiplrophyllum plicatum*, *Bazzania ovifolia* var. *vastifolia* and other mosses. —The pH value of 54744 is 6.4. —This species usually grows on granitic rocks and andesite or deposited humus upon these rocks rather than on trees, thus seems to be a calcifuge species. It is of some interest to note that this is confined to trees in our area, and does not occur on Mt. Apoi where the rocks are mostly of serpentine. —The present genus is a new addition to the flora of Hokkaidō.

* *Tritomaria exsecta* (Schmid.) Schiffn.—On roots and bases of *Pinus parviflora*, 550 m, Mt. Pinneshiri, 54759. —Newly added genus to the hepatic flora of Hokkaidō.

* *Gymnocolea montana* (Horikawa) Hatt. var. *acuta* Hatt., var. nov. —A typo recedit: planta gracillima, foliis remotis, multo minoribus, fere ad (vel ultra) medium bifidis, lobis trigonis, acutis. —On wet, semishaded cliff of talc schist and on damp graywacke ledge, 5~30 m, near coast between Saruru and Shōya, 54705, 54903-typus. —European *G. inflata* is very closely related to the present species. The genus *Gymnocolea* is new to the hepatic flora of Hokkaidō. But, the present species (*G. montana* var. *montana*) is very commonly found in bogs of Mt. Daise-tsu and other high mountains in Hokkaidō, usually associated with *Sphagnum*.

* *Acrobolbus mayebarae* (Hatt.) Hatt. —Syn. *Cephalozia mayebarae* Hatt. —Crevices of limestones in shade, 250~280 m, Esamanbetsu, 55099, 55131. —The pH value of 55099 is 7.6. —This species has always been found on shady limestones, and seems to be one of the decidedly calciphilous hepaticae. Hitherto known from several calcareous regions in Honshū, Shikoku and Kyūshū. European *A. wilsonii* is closely related to this species. —A newly added genus to Hokkaidō.

Fam. JUNGERMANNIACEAE

* ***Jamesoniella autumnalis*** DC. Syn. *J. viridis* St. msc.; *J. nipponica* Hatt. — On **serpentine**, occurring with *Euosmolejeunea auriculata*, occasionally with *Bazzania ovifolia* var. *vastifolia*, *Plectocolea prostrata*, summit of Mt. Apoi, 54801, 54810. — Among grasses in serpentine areas, often with *Diplophyllum taxifolium*, *Plagioclila* sp., 700~810 m, Mt. Apoi, 54824, 54676. — On decaying log, with *Blepharostoma trichophyllum*, *Cephalozia* sp., *Lophocolea heterophylla*, ca 300 m, near Toyoninuma, 54869. — The pH of 54676 is 6.8. — The genus is new to Hokkaidō.

* ***Solenostoma atrovirens*** (Schl.) K. Müll. (det. Amakawa) Syn. *J. claviflora* Steph. — On damp black slate in shade, with *Plectocolea prostrata*, ca 250 m, Esamanbetsu, 54937. — On shady moist graywacke, 200 m, along stream west side of Mt. Apoi, 54766.

* ***Solenostoma exsertifolium*** Steph. (det. Amakawa) — On shady, damp **limestones**, 250m, Esamanbetsu, 54911, 54938. — The present species seems to be closely related to (or possibly conspecific with) *S. cordifolium*. However, the above-cited specimens are smaller than *S. cordifolium* and rather similar to *S. triste* in appearance. Further, it occurs on limestone, whereas *S. cordifolium* grows in bogs and other acidic substrata.

* ***Solenostoma pyriferum*** Steph. (det. Amakawa) Syn. *Jungermannia pyriferum* Steph.; *J. monticola* Hatt. — Graywacke crevices, 200 m, along stream west side of Mt. Apoi, 54769.

Solenostoma rotundifolium Amakawa, msc. — Crevices of graywacke, occurring with *Scapania undulata*, 5~30 m, near Horoizumi, 54909-typus.

* ***Solenostoma triste*** (Nees) Hatt. (det. Amakawa). — On shady, moist **limestone**, 250 m, Esamanbetsu, 54917, 54923, 54925. — Graywacke crevices, 200 m, Esamanbetsu, 54774.

Plectocolea biloba Hatt., msc. — Graywacke crevices, 200 m, along stream, west side of Mt. Apoi, near Samani, 54772-typus.

Plectocolea prostrata (Steph.) Hatt. — Crevice and moist surface of **serpentine**, with *Jamesoniella autumnalis*, *Bazzania ovifolia* var. *vastifolia*, 700 m to the summit of Mt. Apoi, 54636, 54801. — Graywacke and chert crevices, 60~200 m, near Samani, 54629, 54891. — On conglomerate, with *Conocephalum conicum*, *Blepharostoma minus*, etc., 5~10 m, along coast near Samani. — On graywacke, 400 m, near Toyoninuma, 54873. — On clay-slate and hornfels, 5~30 m, along coast near Saruru, 54891. — On damp banks by brooklets, often with *Geocalyx lancistipulus*, *Conocephalum conicum*, etc., 40~60 m, Erimo Pen., 55133, 55135, 55139, 55145-6.

Nardia grandistipula Steph. (det. Amakawa) — On bank side of brooklets, near coast, with *Plectocolea* sp., 40~60 m, Erimo Pen., 55132, 55136-7.

* ***Mylia verrucosa*** Lindb. — On decaying wood, or humus covered tree bases and roots, 300~350 m, Mt. Apoi, 54723, 54734. — The genus is a new addition to the hepatic flora of Hokkaidō.

Fam. PLAGIOCHILACEAE

Pedinophyllum interruptum (N.) Lindb. — On black slate, 200~250 m, Esamanbetsu, 54936, 54939. — On graywacke, 200 m, along streams west side of Mt. Apoi, 54768. — On *Cercidiphyllum japonicum* trunks, bases and roots covered by thin

humus, 200 m, Esamanbetsu, occasionally with *Porella grandiloba*, 22578, 54921, 54935, 54944. —var *pyrenaicum* (Spr.)=*P. pyrenaicum* (Spr.) Lindb. —On black slate, 200 m, Esamanbetsu, 54910, 54927. —On conglomerate, with *Lejeunea japonica*, *Radula obtusiloba*, 5~10 m above sea, near Samani, 54624. —On decayed wood, 250 m, near Toyoninuma, 54847.

Plagiochila ovalifolia Mitt. —Crevices of graywacke, 200~350 m, along stream west side of Mt. Apoi, 54765, 54770, 54776. —fo. *odatensis* (Steph.) Hatt. —On shady, wet black slate, 200~250 m, Esamanbetsu, 22511, 54913, 54920, 54932. —On and among limestone in damp, shady places, 250 m, Esamanbetsu, 54933. —The pH value of 54933 is 6.7.

* *Plagiochila satoi* Hatt. Syn. *Pl. japonomontana* Hatt.; *Pl. ovalifolia* var. *dentosa* Hatt.; *Pl. dentosa* Hatt. —On serpentine-faces and -crevices, with *Diplophyllum taxifolium*, *Radula obtusiloba*, *R. amentulosa*, *Blepharostoma minus*, or with *Bl. trichophyllum*, or occasionally with *Bazzania ovifolia* var. *vastifolia*, from 400 m alt. to summit of Mt. Apoi, 54677, 54680, 54686, 54699, 54716, 54724-5, 54786, 54795, 54802, 54827, 54832. —On quartz-porphry, 650 m, Mt. Pinneshiri, 54762. —On black slate, 200 m, Esamanbetsu, 54929. —Among grasses, with *Euosmolejeunea auriculata*, summit of Mt. Apoi, 54783. —On *Abies* trunks and bases, 550 m, Mt. Pinneshiri, 54741.

Fam. SCAPANACEAE

Diplophyllum taxifolium (Wahl.) Dum. —On and among serpentine rocks, ca 400 m to summit of Mt. Apoi (810 m), occurring with *Radula obtusiloba*, *Plagiochila satoi*, or occasionally with *Blepharostoma minus*, *Bl. trichophyllum*, *Frullania moniliata* subsp. *obscura*, *Herberta sakuraii*, *Euosmolejeunea obtusifolia*, or *Bazzania ovifolia* var. *vastifolia*, 22208, 54660, 54667, 54670, 54679, 54699, 54700, 54614-5, 54725, 54728, 54739, 54807-8, 54821, 54830, 54843. —Graywacke crevices, with *Radula obtusiloba*, ca 200 m, west side of Mt. Apoi, 54778. —On humus covered graywacke, with *Bazzania ovifolia* var. *vastifolia* or *Plagiochila* sp. or rarely with *Metzgeria conjugata* var. *japonica* and *Porella vernicosa* var. *sasakii*, ca 400 m, near Toyoninuma, 54871, 54877. —On decaying log, with *Lepidozia reptans* and *Bazzania ovifolia* var. *vastifolia*, 550 m, Mt. Pinneshiri, 54749. —On humus, with *Calyptogeia neesiana*, 450 m, Mt. Apoi, 54720. —On *Abies* forest floor, with *Bazzania ovifolia* var. *vastifolia*, and other mosses, ca 400 m, near Toyoninuma, 54858, 54862. —Among grasses in serpentine areas of summit of Mt. Apoi, with *Jamesoniella autumnalis* or *Plagiochila satoi*, 54824. —On humus covered base of trees, with *Bazzania ovalifolia* var. *vastifolia*, ca 40 m, near Horoman, 54612. —The pH value of 54739 is 6.6. —This is one of the commonest species not only in the present area but also in all the other montane areas of Hokkaidō and Northern Honshū, and occurs on various substrata except limestone. Thus, it seems to have a wide ecological amplitude. *Diplophyllum albicans*, another common species in Japanese highland, is not found in our area.

Macrodiplphyllum plicatum (Lindb.) Perss. —Among serpentine rocks, 500~810 m, Mt. Apoi, often occurring with *Frullania moniliata* subsp. *obscura*, *Herberta sakuraii* or rarely with *Radula amentulosa*, *R. obtusiloba*, *R. boryana*, *Euosmolejeunea obtusifolia*, *Nipponolejeunea pilifera*, *Metzgeria conjugata* var. *japonica* or *Bazzania trilobata*, 22247, 22277, 54640-1, 54643, 54655, 54657, 54663,

45671, 54675, 54682, 54691, 54701, 54704, 54713, 54737, 54792, 54822, 54825-6, 54836. —Among quartz-porphry, often with *Frullania moniliata* subsp. *obscura*, *Bazzania ovifolia* var. *vastifolia*, *Herberta sakuraii*, or rarely with *Diplophyllum taxifolium*, *Microlepidozia makinoana*, 550~650 m, Mt. Pinneshiri, 54743, 54745-8, 54763. —On *Abies* trunk with *Anastrophyllum japonicum*, *Scapania* sp., ca 400 m, Mt. Pinneshiri, 54747. —The pH value of 54744 is 6.4. —One of the commonest species not only in our area but also in the montane~alpine regions of Hokkaidō and Northern Japan.

Scapania parvitexta Steph. —On decayed log, with *Bazzania ovifolia* var. *vastifolia*, *Calypogeia neesiana*, *Lepidozia reptans*, *Mylia* sp., 550 m, Mt. Pinneshiri, 54748; pH 5.8. —On dead wood of *Betula apoensis*, in the same locality, 54759. —var. *minor* Hatt. Syn. *S. parvidens* Steph. —Crevices of black slate, 250 m, Esamanbetsu, 54918. —Crevices of graywacke, 5~30 m (seaside) near Samani, 54907. —Rare in our area.

Scapania spinosa Steph. —On rotten log in shade, with *Riccardia japonica*, *Cephalozia nipponica*, *Odontoschisma denudatum*, or *Lepidozia reptans*, 400 m, Mt. Apoi, 54718. —Rare in our area.

* *Scapania undulata* (L.) Dum. —On wetty graywacke, with *Solenostoma rotundifolium*, 3~50 m, near Horoizumi, 54909. —Rare in our area.

Fam. HARPANTHACEAE

Harpanthus acutatus (Web. et Mohr) Spr. —On semishaded decaying log, ca 400 m, Toyoninuma, 54679. —This is the first collection made in Hokkaidō, which the author could confirm.

* *Geocalyx lancistipulus* (Steph.) Hatt. in Journ. Jap. Bot. 28-8: 234 (1953). Syn. *Lophocolea lancistipula* Steph.; *Lophocolea rhombifolia* Steph.; *Geocalyx graveolens* Auct., quoad plant. Japon.; *G. graveolens* var. *otianus* Hatt.; *G. yakusimensis* Hatt. —On damp soil side of stream, occasionally with *Conocephalum conicum*, *Plectocolea prostrata*, ca 50 m, Erimo Pen., 55133, 55145-6. —The genus *Geocalyx* is new to the flora of Hokkaidō.

Fam. CEPHALOZIACEAE

Cephalozia hakkodensis Steph. —On decaying log in shade, with *Lophozia incisa*, *Mylia* sp., *Riccardia* sp., 450 m, Mt. Pinneshiri, 54761.

Cephalozia media Lindb. (det. T. Amakawa) —On bark and bases of *Pinus pumila*, summit of Mt. Apoi, with *Calypogeia neesiana*, *Lepidozia reptans*, *Ptilidium pulcherrimum*, 54789.

* *Cephalozia nipponica* Hatt. (det. T. Amakawa) —On decayed wood in shade, with *Lepidozia reptans*, *Odontoschisma denudatum*, occasionally with *Scapania spinosa*, *Riccardia japonica*, 400~450 m, Mt. Apoi, 54647, 54718.

Cephalozia otaruensis Steph. (det. T. Amakawa) —Crevices of quartz-schist, with *Calypogeia neesiana* var. *japonica*, 60 m, along the Horaman river, 54618.

* *Odontoschisma denudatum* (L.) Dum. —On decaying wood, with *Lepidozia reptans*, *Cephalozia nipponica*, or occasionally with *Riccardia japonica*, *Scapania spinosa*, 400~450 m, Mt. Apoi, 54647, 54653, 54718, Mt. Pinneshiri, 54742a. The present genus is new to Hokkaidō.

Fam. LEPIDOZIACEAE

* ***Lepidozia reptans*** (L.) Dum. Syn. *L. obliqua* Steph. in Bull. Herb. Boiss. 5: 94 (1897) —syn. nov. (vidi typum) —On humus bank, often with *Bazzania ovifolia* var. *vastifolia*, ca 500 m, Mt. Apoi, 22206, 54696. —On bark and base of *Pinus pumila*, with *Cephalozia media*, *Calypogeia neesiana* var. *japonica*, *Ptilidium pulcherrimum*, summit of Mt. Apoi, 54789. —*Abies* forest floor, with *Bazzania ovifolia* var. *vastifolia*, ca 500 m, near Toyoninuma, 54852, 54883. —On decaying wood, with *Bazzania ovifolia* var. *vastifolia*, rarely with *Diplophyllum taxifolium*, *Myliia* sp., *Calypogeia neesiana* var. *japonica*, *Scapania parvitexta*, 450~500 m, Mt. Pinneshiri, 54748-9, 54755. —On decayed log, with *Odontoschisma demudatum*, *Cephalozia nipponica*, occasionally with *Lepidozia reptans*, *Riccardia japonica*, 400~450 m, Mt. Apoi, 54647, 54718. —On bases of *Pinus parviflora*, with *Bazzania ovifolia* var. *vastifolia* and *Frullania moniliata* subsp. *obscura*, 54754. —On bark of *Pinus pumila* with musci, 810 m, summit of Mt. Apoi, 54703. The pH value of 54748 is 5.8.

* ***Microlepidozia makinoana*** (Steph.) Hatt. Syn. *Lepidozia setacea* auct., quoad plant. Japon., p. maj. p.; *L. exigua* Steph. —On clayey soil (\pm incl. humus), 100~200 m, Mt. Apoi, with *Bazzania ovifolia* var. *vastifolia*, or occasionally with *Calypogeia tosana*, 54736-8. —On quartz-porphry, with *Bazzania ovifolia* var. *vastifolia*, *Diplophyllum taxifolium*, *Macrodiplrophyllum plicatum*, 550 m, Mt. Pinneshiri, 54763.

* ***Bazzania ovifolia*** (Steph.) Hatt. var. *vastifolia* (Steph.) Hatt. Syn. *Mastigobryum vastifolium* Steph. —Crevices of serpentine rocks, occurring with *Diplophyllum taxifolium*, *Blepharostoma minus* and *Plagiochila satoi*, or occasionally with *Jamesoniella autumnalis*, *Plectocolea prostrata*, from 400 m to summit area of Mt. Apoi, 54680, 54739, 54801. —On or among quartz-porphry, occurring with *Macrodiplrophyllum plicatum*, *Frullania moniliata* subsp. *obscura*, *Herberta sakuraii*, rarely with *Microlepidozia* and *Diplophyllum taxifolium*, Mt. Pinneshiri, 550~650 m, 54745-6, 54763. —On graywacke, occurring with *Metzgeria conjugata* var. *japonica*, *Radula japonica*, *Plagiochila* sp., *Calypogeia trichomanis*, *Diplophyllum taxifolium*, 400~500 m, near Toyoninuma, 54865, 54875, 54877, 54884. —On soil, with *Calypogeia neesiana* var. *japonica*, *Microlepidozia makinoana*, Mt. Apoi, ca 200 m, 54738. —On humus, with *Bazzania trilobata*, *Microlepidozia makinoana*, ca 100 m, Mt. Apoi, 54736, with *Lepidozia reptans*, ca 500 m, Mt. Apoi, 22206. —On decayed logs, occurring with *Calypogeia neesiana* var. *japonica*, *Lepidozia reptans*, rarely with *Myliia* sp., *Scapania parvitexta*, 450~600 m, Mt. Pinneshiri, 54742, 54748, 54755, 54749. —On *Abies* forest floor, occurring with *Lepidozia reptans*, occasionally with *Diplophyllum taxifolium*, 400~500 m, near Toyoninuma, 54852, 54861-2, 54881, 54883. —On humus covered tree bases, with *Diplophyllum taxifolium*, ca 40 m, near Horoman, 54612. —On bases of *Pinus parviflora*, occurring with *Lepidozia reptans* and *Frullania moniliata* subsp. *obscura*, ca 600 m, Mt. Apoi, 54754. —On *Picea* bases, with mosses, ca 500 m, Mt. Apoi, 54703. —On *Picea* trunks, with *Anastrophyllum japonicum* and *Bazzania trilobata*, 450 m, Mt. Pinneshiri, 54752. —The pH value is 5.8 by the specimen 54748, and 6.6 by 54739. The present variety has hitherto been known in Tōhoku District, Honshū, but it is

rather common in the montane regions of Hokkaidō and the northern Honshū. In the southern parts it is replaced by the type form (*B. ovifolia* var. *ovifolia*).

Bazzania trilobata (L.) Gray —On **serpentine** gravels and sand, among grasses in exposed and dry place, with *Cladonia*, summit of Mt. Apoi, or in shade, with lichens and mosses, ca 500 m, Mt. Apoi, 54722, 54735. —On serpentine rocks in shade~semishade, ca 400 m, Mt. Apoi, 54719, 54721, 54729. —Serpentine crevices, with *Macrodiplrophyllum plicatum*, summit of Mt. Apoi, 54825, 54836. —On humus covered serpentine rock in shade, 450 m, Mt. Apoi, 54732. —On humus, with *Bazzania ovifolia* var. *vastifolia*, *Microlepidozia makinoana*, ca 100 m, foot of Mt. Apoi, 54736. —The present species is distributed in Northern Japan and mostly grows on decayed wood, humus and even in peaty bogs (such as Ozegahara). In our area, however, it occurs on serpentine and on humus among serpentine rocks, often associated with *Macrodiplrophyllum plicatum*.

Fam. CALYPOGEIACEAE

Calypogeia neesiana (Mass. et Carest.) K. Müll. var. ***japonica*** Hatt. var. nov. Syn. *C. neesiana* Auct., quoad plant. Japon.; *C. integristipula* Steph., quoad plant. Japon. —A typo recedit: olei corporibus in omnibus cellulis foliorum amphigastri-orumque. —On quartz-schist, often with *Cephalozia otaruensis*, 60 m, near Horoman, 54614, 54618. —On roamy humus side of overhanging cliff, 550 m, Mt. Pinneshiri, 54750. —On humus, with *Diplrophyllum taxifolium*, 450 m, Mt. Apoi, 54720. —On bark and bases of *Pinus pumila*, summit of Mt. Apoi, with *Cephalozia media*, *Ptilidium pulcherrimum*, *Lepidozia reptans*, 54789. —*Abies* forest floor, 500~600 m, near Toyoninuma, 54849, 54872. —On decaying logs, with *Bazzania ovifolia* var. *vastifolia*, *Lepidozia reptans*, *Scapania parvitexta*, *Mylia* sp., 450~550 m, Mt. Pinneshiri, 54742, 54748. —The pH value of specim. 54748 is 5.8. —In the Japanese plants, all the leaf- and underleaf-cells contain oil-bodies.

* ***Calypogeia tosana*** (Steph.) Steph. —On humus, with *Bazzania ovifolia* var. *vastifolia*, *Microlepidozia makinoana*, 200~450 m, Mt. Apoi, 54648, 54738. —Among grasses in the serpentine area, summit of Mt. Apoi, with *Blepharostoma minus*, *Plectocolea prostrata*, 54638. —On clayey soil, with *Conocephalum conicum*, *Riccardia shimizuana*, ca 400 m, near Toyoninuma, 54880. —On humus covered gneiss, with *Calypogeia trichomanis*, ca 500 m, near Toyoninuma, 54864.

Calypogeia trichomanis (L.) Cda. —On humus covered gneiss, with *Calypogeia tosana*, ca 500 m, near Toyoninuma, 54864; on humus covered graywacke, with *Bazzania ovifolia* var. *vastifolia*, ca 400 m, near Toyoninuma, 54865. —In the fresh material the characteristic blue oil-bodies were recognized.

Fam. RADULACEAE

* ***Radula amentulosa*** Mitt. Syn. *R. brunnea* Steph.; *R. atnormis* Steph. —Serpentine crevices and surfaces, often with *Frullania monilata* subsp. *obscura*, *Macrodiplrophyllum plicatum*, *Plagiochila satoi*, *Euosmolejeunea obtusifolia*, *Herberta sakuraii*, from 700 m to summit of Mt. Apoi, 54635, 54640, 54673, 54681, 54685, 54689, 54710, 54781, 54786. —Among grasses in the serpentine area, with *Herberta sakuraii*, *Macrodiplrophyllum plicatum*, ca 700 m, Mt. Apoi, 54669.

* ***Radula boryana*** (Web.) Nees Syn. *R. auriculata* Steph. —On **serpentine**-faces

and -crevices, summit area of Mt. Apoi, occasionally with *Macrodiplrophyllum plicatum*, 54704, 54788, 54803.

* *Radula japonica* Gott. —On graywacke, with *Bazzania ovifolia* var. *vastifolia*, *Metzgeria conjugata* var. *japonica*, *Plagiochila* sp., *Diplophyllum taxifolium*, ca 400 m, near Toyoninuma, 54875, 54877, 54885.

* *Radula kanemarui* Hatt. —On **serpentine**-face and -crevices, occasionally with *Diplophyllum taxifolium*, summit of Mt. Apoi, 54687, 54812, 54816. —On serpentine gravels within grasses, summit of Mt. Apoi, 54828, 54835.

Radula obtusiloba Steph. —On **serpentine**-faces and -crevices, with *Diplophyllum taxifolium*, *Blepharostoma minus*, *Bl. trichophyllum*, *Plagiochila satoi*, *Metzgeria conjugata* var. *japonica*, rarely with *Lejeunea rotundistipula*, *Euosmolejeunea obtusifolia*, *Cololejeunea nakajimae*, from 400 m to summit of Mt. Apoi, 22208, 22276, 54634, 54656, 54670, 54692, 54699, 54731, 54737, 54795, 54821-2, 54833. —On conglomerate, with *Lejeunea japonica*, *Pedinophyllum interruptum* (var. *pyrenaicum*), 5~10 m (seaside), near Samani, 54624. —Crevices of graywacke, with *Diplophyllum taxifolium*, 200 m, along stream west side of Mt. Apoi, 54778. —On gneiss, with *Metzgeria conjugata* var. *japonica*, *Porella grandiloba*, *P. vernicosa* var. *sasakii*, 400 m, near Toyoninuma, 54854-5. —The pH value of 54854 is 6.5. —The present species is not uncommon in Hokkaidō and northern Honshū. In our area it occurs on various substrata, and seems to have a very wide ecological amplitude.

Fam. PORELLACEAE

* *Porella gracillima* Mitt. —On **limestone**-face and -crevices, 250~280 m, Esamanbetsu, 55088-9, 55092, 55095, 55100, 55102, 55104, 55106, 55111, 55113, 55119, 55130; on limestone-crevices, with *Porella setigera*, ca 200 m, Esamanbetsu, 54931. —The pH is 8 by 55106. The present species is very closely allied to (and regarded as a subspecies or a variety of) *Porella vernicosa*, but it is a decided calciphilous species and occurs at higher altitudes than the latter species.

Porella grandiloba Lindb. —On and among **limestones**, 250~280 m, Esamanbetsu, 22506, 22727, 22747, 55091, 55094, 55096, 55101, 55103, 55112, 55114-5, 55118, 55121-4. —On gneiss, occasionally with *Metzgeria conjugata* var. *japonica*, *Radula obtusiloba*, ca 400 m, near Toyoninuma, 54850-1, 54855, 54867-8, 54887. —On black slate, often with *Frullania moniliata* subsp. *obscura*, *Plagiochila*, sp., 220~250 m, Esamanbetsu, 22532, 22551, 54941. —On trunk and bases of *Cercidiphyllum japonicum*, occasionally with *Metzgeria pubescens*, *Pedinophyllum interruptum*, *Radula obtusiloba*, 200~250 m, Esamanbetsu, 22528, 22533-4, 22556, 22558, 54915, 54924, 55930, 54944. —This species is the most common species of the genus in Hokkaidō.

Porella setigera (Steph.) Hatt. —Crevices of **limestone**, with *Porella gracillima*, ca 200 m, Esamanbetsu, 54931. —This species usually occurs on limestones.

Porella vernicosa Lindb. Syn. *Porella polita* Mitt.; *Madotheca nigricans* Steph.; *M. spinulosa* Steph. —Crevices of graywacke, ca 200 m, along stream west side of Mt. Apoi, 54764, pH 6.4. —This is very rare in Hokkaidō and northern Honshū.

—var. *sasakii* Hatt. Syn. *Madotheca fauriei* Steph.; *Jubula gracilis* Steph. —

On graywacke, occasionally with *Bazzania ovifolia* var. *vastifolia*, *Diplophyllum taxifolium*, *Plagiochila* sp., ca 400 m, near Toyoninuma, 54844, 54871. —On gneiss, occasionally with *Porella grandiloba*, *Metzgeria conjugata* var. *japonica*, *Radula obtusiloba*, ca 400 m, near Toyoninuma, 54846, 54854, 54870, 55158. —In Hokkaidō, as well as in northern Honshū, var. *sasakii* is common and seems to replace with var. *vernica*, the type form. In middle Honshū, var. *sasakii* is rarer, limited at higher altitude. While var. *vernica* becomes common, occupying lower altitudes, and is distributed further south, as far as the southern end of Kyūshū. The pH value of 54854 is 6.5.

Fam. LEJEUNEACEAE

* *Nipponolejeunea pilifera* (Steph.) Hatt. —Serpentine crevices, summit of Mt. Apoi, with *Frullania moniliata* subsp. *obscura*, *Herberta sakuraii*, *Macrodiplophyllum plicatum*, 54701.

Nipponolejeunea subalpina (Horikawa) Hatt. —On bark of *Pinus pumila*, summit of Mt. Apoi, occasionally with *Ptilidium pulcherrimum*, 54780, 54782, 54790, 54800.

* *Euosmolejeunea auriculata* Steph. —On serpentine rocks, upper Apoi (more than 500 m), mostly summit area (800 m), occurring with *Radula obtusiloba*, occasionally with *Euosmolejeunea obtusifolia*, *Jamesoniella autumnalis*, *Macrodiplophyllum plicatum*, *Metzgeria conjugata* var. *japonica*, 54644, 54688, 54737, 54810, 54818, 54820. —Among grasses in the serpentine area, top of Mt. Apoi, occurring within *Plagiochila satoi*, *Frullania moniliata* subsp. *obscura*, 54783, 54817–8. —The present species is a new addition to the hepatic flora of Hokkaidō, and reaches its northernmost end in our area. Such a northern disjunctive distribution may partly be caused by serpentine as a substratum. —No species of *Euosmolejeunea* have ever been recorded in Hokkaidō.

* *Euosmolejeunea obtusifolia* (Steph.) Hatt. Syn. *Harpalejeunea obtusifolia* Steph.; *Strepsilejeunea pusilla* Hatt. —On serpentine cliff and ledge, more than 500 m, mostly summit area of Mt. Apoi (810 m), often with *Diplophyllum taxifolium*, occasionally with *Radula obtusiloba*, *R. amentulosa*, *Lejeunea rotundistipula*, *Euosmolejeunea auriculata*, *Metzgeria conjugata* var. *japonica*, *Macrodiplophyllum plicatum*, 22227, 22266, 54635, 54654, 54658, 54662, 54674, 54688, 54698, 54715, 54726, 54730, 54779, 54814, 54822, 54840. —On serpentine, 40 m, near Horoman, 54613. —The pH value is 6.4~6.6 by 54726, or 6.8~7.0 by 54698. —The present species reaches to the northernmost limit of its range in the present area. Hitherto it has been recorded from Shikoku and Kyūshū (incl. Yakushima I., type loc.), 30~40° N. Lat., and recently collected by Mr. T. Kodama in the Kii Peninsula of Honshū, ca 34°N. Lat. The present area being about 42°30' N., a disjunctive extension as this, is very remarkable and may be caused chiefly by the preference for serpentine as its substratum.

* *Lejeunea japonica* Mitt. Syn. *L. cavifolia* Auct., quoad plant. Japon.; *L. tozana* Steph.; *L. nipponica* Hatt. —On conglomerate, 5~10 m (seaside) near Horoman, often with *Pedinophyllum interruptum* (var. *pyrenaicum*), *Radula obtusiloba*, 54622, 54624. —On quartz-porphry, summit of Mt. Apoi, with *Frullania moniliata* subsp. *obscura*, *Fr. japonica*, 54666.

* *Lejeunea rotundistipula* (Steph.) Hatt. Syn. *Microlejeunea rotundistipula* Steph.; *Lejeunea curviloba* Steph. —On cliffs and ledges of **serpentine**, from 500 m to summit of Mt. Apoi, often with *Radula obtusiloba*, *Blepharostoma minus*, rarely with *Plagiochila satoi*, *Euosmolejeunea obtusifolia*, *Cololejeunea nakajimae*, 54634, 54656, 54727, 54730, 54831. —Among graywacke, 60 m, along the Horoman river, 54615. —This species may possibly be one of the species characteristic of the serpentine flora.

* *Cololejeunea nakajimae* Hatt. et Kodama Syn. *C. venusta* Auct., quoad plant. Japon., pro maj. parte. —On **serpentine** in shade, summit of Mt. Apoi, with *Lejeunea rotundistipula*, *Blepharostoma minus*, *Radula obtusiloba*, 54656. —European *C. calcarea* (Lib.) Schiffn. is closely related to the present species, but grows usually on limestones, the geographical range is: Crimea—Carpathian—Norway—England—Swiss—Iberia Pen.—Canary I. Another ally is American *C. tuberculata* Evs. which grows on the leaves of *Trichomanes* and on wet rocks, known only in Florida. In Honshū, the present species usually grows on the leaves of trees and ferns. Most of the Japanese plants reported under the name of *C. venusta* has proved to be the present species. The true *C. venusta*, according to Benedix (in Feddes Rept. Beih. 134: 57, Pl. 1: 18–19a–b. 1953), is identical with (and a later synonym of) *C. haskarlana* (G.) Benedix, whose geographical area is Malacca—Lingga Archip.—Sumatra—Java—Borneo—Celebes—Philippines. The Japanese *C. spinosa* (Horikawa) may possibly be conspecific with *C. haskarlana*.

* *Cololejeunea rupicola* Steph. (fo. *minor*) —Crevices of **serpentine** rocks, ca 700 m, Mt. Apoi, creeping on *Bazzania ovifolia* var. *vastifolia*, *Plagiochila satoi* and other mosses, 54680, a few fragments of stem! —This species reaches the northernmost limit of its range in the present area.

Fam. FRULLANIACEAE

Jubula hutchinsiae subsp. *japonica* (Steph.) Horikawa et Ando —Crevices of **serpentine**, with *Metzgeria conjugata* var. *japonica*, *Blepharostoma minus*, *Plagiochila* sp., 150 m, near Horoman, 54616.

* *Frullania densiloba* Steph. —On **serpentine** rocks in rather exposed places, summit of Mt. Apoi, 54705. —This seems to be one of the characteristic species of our area, because it is found nowhere else in Hokkaidō. It is rather common in southern Japan, where it usually grows on bark.

Frullania jackii Gott. Syn. *Fr. japonica* Sde. Lac.; *Fr. jackii* var. *japonica* Hatt.; *Fr. microta* Mass. (incl. var. *microphylla*); *Fr. jishibae* Steph.; *Fr. sawadae* Steph.; *Fr. japonica* subsp. *emarginata* Kamimura. —On **serpentine**, ca 500 m, Mt. Apoi, with *Fr. moniliata* subsp. *obscura*, 54649. —Among graywacke, ca 200 m, along stream west side of Mt. Apoi, 54767. —On quartz-porphry, ca 800 m, Mts. Apoi~Pinneshiri, with *Frullania moniliata* subsp. *obscura*, *Lejeunea japonica*, 54666.

Frullania moniliata subsp. *obscura* Verd. —On **serpentine**: summit of Mt. Apoi, occurring with *Diplophyllum taxifolium*, *Macrodiplrophyllum plicatum*, *Radula amentulosa*, rarely with *Herberta sakuraii*, *Nipponolejeunea pilifera*, *Plagiochila satoi*, *Frullania jackii*, 22207, 22228, 22247, 54632, 54641, 54682, 54684, 54710, 54712, 54771, 54781, 54805, 54811, 54815, 54826, 54841, 54830, 54843; 500~700 m, Mt. Apoi, occasionally with *Radula amentulosa*, *Frullania*

jakii, 22234, 22269, 54639, 54649, 54673; 150 m, along the Horoman river, with *Metzgeria* sp., 22197. —On quartz-porphry: summit of Mt. Apoi, occurring with *Frullania jackii*, *Lejeunea japonica*, 54666; 550~650 m, Mt. Pinneshiri, with *Macro-diplophyllum plicatum*, *Bazzania ovifolia* var. *vastifolia*, rarely with *Herberta sakuraii*, 54743, 54745-6. —On graywacke: ca 100 m, along stream west side of Mt. Apoi, 54711; ca 50 m, near Saruru, 54892. —On black slate: 250 m, Esamanbetsu, occurring with *Porella grandiloba*, 22532, 54941. —Among grasses in the serpentine area: top of Mt. Apoi, occurring with *Euosmolejeunea auriculata*, 54637, 54817. —Grassy bank, ca 50 m, Erimo Pen., 22756. —On trunks and bases of *Picea*, *Abies*, *Pinus pumila*, *Magnolia obovata*: ca 500 m, Mt. Apoi, 22253, 22271, 54659, 54673, 54683, 54690, 54702. —On *Ulmus*: 80 m, near Toyoninuma, 54882. —On *Cercidiphyllum japonicum*: ca 200 m, Esamanbetsu, 54922. —On bases of *Pinus parviflora*: ca 600 m, Mt. Pinneshiri, occurring with *Bazzania ovifolia* var. *vastifolia*, *Lepidozia reptans*, 54754. —The pH value of 54965 is 6. —This species is very variable and is one of the commonest species in Japan. Indeed it occurs from the coastal plain up to the top of high mountain, ca 3000 m in altitude. In the present area also, it is commonly found on various substrata as listed above.

* *Frullania truncatifolia* Steph. —Crevices of limestone ledge, 250 m, Esamanbetsu, 54912. —On gneiss, with lichens, *Metzgeria* sp., ca 400 m, near Toyoninuma, 54845, 54857, 54863.

大分県由布岳頂上に於ける蘚苔類の植生

野 口 彰, 宮 本 光 生

Akira NOGUCHI and Mitsuo MIYAMOTO: The bryophyte vegetation on the summit of Mt. Yufu, Ōita Pref., Japan

由布岳は別府市の西方に位置する海拔高 1584 m の休火山で、輝石安山岩から成る。形は模型的な円錐体で、頂上には口径約 400 m の旧火山口がある。火口をとりまく稜線は南と北で鞍部を作つていて、頂上は東、西の両峯に分れ、西の峯が僅に高い。山の西面及び南面の自然林は破壊され、中腹から頂上にかけては草原化しているところが多い。この研究の対象になつた 1300 m 以上の外壁は、草原の急斜面に安山岩の岩塊が至るところに散在して、コウツギ、コゴメウツギ、コツクバネウツギ、平盤状のミヤマキリシマ、優性になつたノリウツギ、ヤマヤナギ、ヤシヤブシ等がみられ、またアセビの小群落も所々にある。火口壁の稜線部も岩塊が露出して (Pl. I, 1), その間には前に記したような小木が多い。冬には寒風を強く受けて、いずれも小さい。ノリウツギも優性化して 1 m 前後の高さになり、ミヤマキリシマは平盤状をなして地表面に接しているものが多い。特に記すべき草本としてはマイズルソウ、イワカガミ、キオン、キクアザミ等がある。火口の内壁部は、地形、方位、風霧の流れによつて植生がかなり違つている。西の峯の内壁は急傾斜で、ノリウツギ、ミヤマキリシマ、コウツギ、コゴメウツギが多くなり、殊に火口の西北壁にはツツジが原と呼ばれるミヤマキリシマの群生区域がある。これに反して、東の峯の内壁即ち西に面している側の斜面は西の峯に比較するとゆるく、ここにはノリウツギが優占している。株元で 10 cm 内外の径があり、高さも 3~4 m に達し、多くは株元から斜にのび出している。又ミヤマキリシマは上にのびて、分枝の割合い少い形のものが多い。旧火口は深さが 100 m 以下にすぎず、口底には大小の転石が多くて、その上を樹木が覆つている。樹木は最高 4~5 m の高さのノリウツギが優占し、林床は転石のために通行が困難である。

この山の頂上附近は、本来ならばブナ帯に属する高さをもつているのであるが、現状は上に記したように、大木はなく、ブナ林とは違つた蘚苔類の植生がみられるのに興味を覚えた。尤も、今回の筆者等の調査は、蘚苔類の群落生態学的調査というよりも、むしろ環境との関連を考慮して、蘚苔類の種の生育状況を知ることが意図したものである。

苔類の種名は服部植物研究所の服部新佐博士に同定を仰いだもので、謝意を表する。

山頂附近の風霧流

山麓にあたる由布院盆地の朝霧は濃く、この霧は由布岳の約 1200 m の高さにあるクロマツ林をなでながら東に向つて流れ、主流は鶴見岳との鞍部に入つて二分し、その一部は東の峯稜線に向つて猛烈に吹きあげる。冬季には約 1200 m 以上の地域に霧氷をつける。一方、日出生台、安心院盆地から来る風霧は西の峯に連なるいくつもの稜線にぶつかりながら西の峯稜線に向つて強く吹き上げる。この霧の流れは 1200 m の高さあたりで二分し、一は西の峯頂上に吹きあげた後、更にのびて東の峯の内壁にぶつかる。この流れの最も強くあたる西の峯の頂上から西北方ツツジガ原にかけては、樹氷、積雪が最も多い。他の支流は頂上近くの南面鞍部から旧火口内に吹きこみ、更に進んで東の峯内壁を吹き上げる。この霧の流れによつて、冬季は、西面では 1000 m、南面では 1200 m 以上に樹氷をみる。

- 1) 熊本大学理学部生物学教室, 財団法人服部植物研究所 (兼)
- 2) 大分市立王子中学校

第 2 表 東の峯稜線部

Hydrangea
paniculata
(ノリウツギ)

| | | | | | |
|--|-----------|-----------|---------|-----------|--|
| | D. d. +++ | D. m. +++ | B. m. + | F. m. +++ | |
| | B. m. + | B. m. + | | | |

"

| | | | |
|----------|---------|----------|--|
| F. m. ++ | Ms. +++ | U. c. ++ | |
| B. m. ++ | L. r. + | F. m. + | |

"

| | | | |
|-----------|-----------|-----------|--|
| L. r. +++ | L. r. +++ | M. s. +++ | |
| D. h. + | P. l. + | D. h. + | |

"

| | | | |
|-----------|-----------|------|--|
| M. s. +++ | M. s. +++ | L. + | |
| R. a. ++ | R. a. ++ | | |

Deutzia scabra
var. nakaii
(コウツギ)

| | | | |
|--|----------|-----------|--|
| | B. b. ++ | E. p. +++ | |
| | | U. c. ++ | |

"

| | | | |
|--|----------|----------|--|
| | B. b. ++ | B. b. ++ | |
| | B. a. ++ | O. h. + | |

"

| | | | | |
|----------|----------|-----------------|---------|--|
| U. c. ++ | O. h. ++ | U. c. +++ | E. p. + | |
| | E. p. ++ | D. h. + U. c. + | | |

"

| | | | |
|--|-----------|----------|--|
| | E. p. +++ | U. c. ++ | |
| | D. h. ++ | L. + | |

"

| | | | |
|----------|-----------|-----------------|--|
| B. h. ++ | U. c. +++ | E. p. ++ | |
| | E. p. ++ | M. b. ++ | |
| | | B. m. + F. u. + | |

Rhododendron
kiusianum
(ミヤマキリシマ)

| | | |
|--|-----------|--|
| | H. s. +++ | |
|--|-----------|--|

Abelia serrata
(コツクバネ)

| | | | | |
|--|-----------|-----------|----------|--|
| | L. r. +++ | L. r. +++ | D. h. ++ | |
|--|-----------|-----------|----------|--|

"

| | | | | |
|-----------|-----------|-----------|----------|--|
| D. d. +++ | D. d. +++ | L. r. +++ | D. h. ++ | |
| | | D. d. ++ | B. m. + | |

"

| | | | |
|--|-----------|----------|--|
| | O. h. +++ | U. c. ++ | |
| | B. b. + | B. m. + | |

第3表 西の峯稜線部

| | | |
|---|---|--|
| ○ | F. u. + F. u. + | |
| ○ | D. d. + E. p. + F. u. + U. c. ++ | |
| □ | F. m. + F. m. + F. m. + B. m. + O. h. ++ B. m. + O. h. + U. c. ++ | |
| □ | H. c. ++ B. m. ++ F. m. ++ F. m. ++ H. p. ++ D. h. + O. h. ++ F. m. + | |
| □ | B. m. ++ B. m. ++ B. m. ++ F. m. ++ F. m. ++ N. p. + O. h. ++ U. c. ++ | |
| □ | M. d. ++ F. m. ++ F. m. ++ F. m. ++ U. c. + U. c. ++ D. c. ++ B. m. + B. m. + L. + O. h. ++ | |

○ *Deutzia scabra* var. *nakaii* (コウツギ)□ *Hydrangea paniculata* (ノリウツギ)

第4表 西の峯の内壁

| | | |
|---|--|--|
| ○ | L. r. +++ L. r. +++ D. h. + L. + | |
| □ | L. r. +++ U. c. ++ U. c. ++ O. h. + | |
| □ | D. d. +++ L. r. +++ U. c. ++ U. c. ++ D. d. + L. + U. c. +++ B. m. + U. c. + D. h. + | |
| △ | R. a. +++ M. s. ++ N. p. + | |
| △ | D. h. ++ L. + L. + D. h. ++ D. h. ++ | |

○ *Abelia serrata* (コソクバネ) □ *Hydrangea paniculata* (ノリウツギ)△ *Rhododendron kiusianum* ミヤマキシマ

第 5 表 東の峯の内壁

| | | | | | |
|---|--------------------------|---------------------|------------|---------------------------------------|------------------|
| ○ | M.s.+++ L.r.++ P.l.++ | M.s. L.r.++ | +++ ++ | L.r.+++ M.s.+++ U.c.+ | U.c.++ |
| ○ | T.t.+++ G.v.++ | D.d.+++ B.m.+ | +++ + | D.d.++ F.m.+++ M.b.++ D.h.++ | F.m.++ M.b.++ |
| ○ | D.c.+++ T.t.++ | D.c.+++ T.c.++ | +++ ++ | D.c.+++ T.t.++ | +++ ++ |
| ○ | H.c.+++ H.pr.+++ | H.c.+++ H.pr.+++ | +++ +++ | | |

○ *Hydrangea paniculata* (ノリウツギ)

| | | | |
|---------|--|--------|--|
| B. a. | - <i>Barbella asperifolia</i> | H. p. | - <i>Hypnum plumaeforme</i> |
| B. b. | - <i>Brachythecium buchanani</i> | H. pr. | - <i>Hylocomium proliferum</i> |
| B. m. | - <i>Boulaya mittenii</i> | H. s. | - <i>Herberta sakuraii</i> |
| B. n. | - <i>Brachymenium nordenskiordii</i> | L. r. | - <i>Lesquereuxia robusta</i> |
| D. c. | - <i>Dolichomitria cymbifolia</i> | M. s. | - <i>Meteoriella soluta</i> |
| D. d. | - <i>Dolichomitriopsis diversiformis</i> | N. p. | - <i>Nipponolejeunea pilifera</i> |
| D. den. | - <i>Dicranodontium denudatum</i> | O. h. | - <i>Okamuraea hakoniensis</i> |
| D. h. | - <i>Dicranum hakkodense</i> | P. l. | - <i>Pseudobarbella levieri</i> |
| D. m. | - <i>Dicranum mayrii</i> | R. a. | - <i>Rhacomitrium anomodontoides</i> |
| E. p. | - <i>Entodon perichaetialis</i> | R. c. | - <i>Rhacomitrium canescens</i> var. <i>ericoides</i> |
| F. m. | - <i>Frullania moniliata</i> | T. t. | - <i>Thuidium toyamae</i> |
| F. u. | - <i>Frullania usamiensis</i> | U. c. | - <i>Ulota crispula</i> |
| G. v. | - <i>Gollania varians</i> | L. | - <i>Lichen</i> |
| H. c. | - <i>Hylocomium cavifolium</i> | | |
| H. l. | - <i>Haplophymenium longinerve</i> | | |

れている。なお、かようなミヤマキリシマの枝内には *Dicranum mayrii* も侵入しているのがみられた。岩石の附近で、岩石が穴になつて湿つていところには、やや違つた植生がある。穴の天上の岩面には *Bryoxiphium savatieri* や苔類の *Gymnomitrium noguchianum* がみられ、土壤上には *Pogonatum inflexum* の小群落がある。

2) 火口内の樹陰——旧火口のノリウツギの林床は大きな岩石で埋められ、岩石上の腐植土或は岩石間の土壤上には、この地方のブナ帯以上に出現するような種がみられる。*Pogonatum contortum*, *Polytrichum attenuatum*, *Hylocomium proliferum*, *H. calvescens*, *H. cavifolium*, *Gollania varians*, *Thuidium toyamae*, *Meteoriella soluta*, *Pseudobarbella levieri*, *Atrichum undulatum* 等。このうち *H. proliferum* と *H. cavifolium* とが優占する。*G. varians* は腐木上或は腐植土上に出るのが普通であるが、ここではノリウツギの株元にとどまらず、枝まではい上つている。空中湿度の高いことを物語つていものであろう。岩石の腐植土上には、また、*Bazzania fissifolia* var. *subsimplax*, *Scapania*

parvitexta var. *minor*, *Blepharostoma minus*, *Nipponolejeunea pilifera*, *Marsupella parvitexta*, *M. tubulosa* 等の苔類が生育し、殊に高地性の *Marsupella* 属の 2 種が優占している。火口内は通行が困難なので、樹上の植生に就ては十分の調査が出来ていない。

3) 倭性樹上——頂上附近は狭い区域であるけれども、地形、方位、気象状況によつて樹木植生もかなり変化がある。それに応じて、樹木上の蘚苔類植生にも変化が多くて、この山に於て最も興味が多い。ヤシヤブシ、ヤマヤナギには蘚苔類が殆ど着生しないが、これは樹皮の物理的性質によるものであろう。第 1~5 表に地域別にして蘚苔類の着生状況を示す。ワクの長さは大略の樹高を示し、左方が株元で、右方が梢にあたる。目盛は大略 5cm の間隔を示し、II は分枝をあらわしてある。略種名が平行して記してあるのは同じ位置に出て、多くの場合混生している。種名の後の +・・・■■■ は蘚座の広さの程度をあらわしてある。

山林中では樹木の基部に株元植生が発達するのは通例のことである。九州地方なら、本来の株元に出る種の *Dolichomitriopsis diversiformis* などの群落に混つて、林床或は林内岩上に生活の本拠をもつている *Thuidium toyamae*, *Gollania* spp., *Hypnum fujiyamae*, *Mnium cuspidatum*, *Hylocomium cavifolium* などが樹木の基部に這い上つて株元植生を作る。由布山頂で株元植生の発達するのは火口底及び火口壁の部分で、而も殆どノリウツギに限られている。殊に、東の峯の内壁及び南側鞍部内壁で著るしい。稜線部及び外壁は地床が乾燥し、又、樹木が小さいので、コウツギ、コックバネの株元には、その附近に地床性の蘚苔類が生育していても、それらが殆ど這い上つていない。却つて後に記す樹木の主幹、又はそれ以上のところに出易い種の *Ulotia crispula*, *Entodon perichaetialis*, *Frullania usamiensis* 等が地表近くに出てくる。株元植生は地表附近の湿度が高い場合によく発達し、空中湿度の高い程この植生の出来る高さは高くなる。又、樹幹の大きさにもより、幹の小さい場合には、たとえ上のような環境内でも株元植生はよくない。この山頂の株元植生で著るしいことは、九州のブナ帯の著るしい株元植生を作る *Dolichomitriopsis diversiformis* がむしろ少く、却つて通常樹幹から懸垂する *Meteoriella soluta*, *Pseudobarbella levieri*, *Lesquereuxia robusta* が著るしい植生を作っていることである。このうち前二者はヒマラヤ方面から台湾の高地にも分布し、最後者は日本の北方地域の山地に分布するもので、これらが同じ場所に生育しているのは興味深い。これらが混生する場合には *L. robusta* が他の 2 種より上方の位置を占めるのが普通である。これらの種もコウツギなどの灌木には出にくく、従つてノリウツギの、而もかなり陽当りのよい株元に出易く、火口内壁の東南部に多い。又 *M. soluta* と *P. levieri* とは株元から更に腐植土のある地表や岩上までひろがる。通常樹木の主幹生のものである *Boulaya mittenii*, *Entodon perichaetialis*, *Okamuraea hakoniensis*, *Macromitrium brachycladulum*, *Dicranum hakkodense* がみられ、*Frullania moniliata* subsp. *obscura* も主幹に出易い。樹幹でも大きいもの程、蘚苔類の種数は別として、広い蘚座を作ることである。この地域に多い灌木の幹は、もちろん大木のように主幹部とか樹梢部の区別は、生態的には殆ど考えられない。しかし、灌木の茎枝の太さはこれらの蘚苔類の着生に影響している。常に茎枝の上位に位置を占めるのは団塊状の *Ulotia crispula* と、小枝に散生して密着している *Frullania usamiensis* である。この両種と *Dicranum hakkodense* は pioneer として灌木枝に出で、しかも分枝部及び枝の跡からつきはじめ、更に茎の方にもひろがる。灌木や小木の梢に *U. crispula* が見事な団塊を作っている景観は霧のあたるツツジが原附近及び西の峯の北方稜線部に多い。灌木でも茎の部分に多く出るものは *Entodon perichaetialis*, *Okamuraea hakoniensis*, *Boulaya mittenii*, *Lesquereuxia robusta*, *Frullania moniliata* subsp. *obscura* 等である。これらの種の中で、最初に附着するものは、まず胞子の出来易い *E. perichaetialis* で、この種が幹に密着して体をのばしていく。樹幹にこれらの pioneer が生じて着床が出来てくると、次第に他の種が侵入をはじめ *Okamuraea*, *Boulaya*, *Frullania moniliata* subsp. *obscura* のように、ほうように茎をのばしてフンワリした蘚座をつくるものが優位にたち、*U. cris-*

pula, *D. hakkodense*, *E. perichaetialis* は次第に枝の上方へ追い上げられる。*Okamuraea*, *Boulaya*, *F. moniliata* subsp. *obscura* が他の種の座の上にはびこっている状態はしばしばみるところである。*Okamuraea hakoniensis* は強い風に吹きさらされる外壁、殊に、東の峯の外壁部に多く、コウツギの株全体を純群落で覆っているのをしばしばみかける。この種の基本型は下方の森林帯の大きい樹幹に多く、鞭枝をもたないか、或は枝帯が僅かに鞭状にのびる程度のものである。ところが、上のような環境に出るものは灌木の小枝にも群集し、枝に多数の、しかも長い鞭枝を具えた型になるが、空中湿度に適応した形であろう。

考 察

調査地域は九州では高山の部類に属し、所謂の亜高山的な気象のもとにある。ここに生育する蘚苔類は、種類の上からみれば豊富とは云えない。しかし、その生育状況、殊に着生の蘚苔類植生は注目すべきものと思われる。

樹木の株元に蘚苔類の植生が発達することは普通の現象である。北日本などの乾いた落葉樹林に於てさえも、地上 40~50 cm の高さまで、この植生がみられ、下生えが高く、又、光量が乏しくない場合には、この範囲は 1 m 以上の高さに及ぶ。しかし、数米の高さまでも、この植生がよく発達するのは、北日本ではむしろ特殊の場合である。北日本に於て樹幹の数米の上まで蘚苔類の植生が著しくみられるのは、適度の湿気と光量に恵まれて、本来主幹生の種類によつて占められている場合である。そして株元に生育する蘚苔類の種は、林床に生育するものと殆ど共通である。西南日本に於ては、株元植生は 1 m 位の高さまで発達し、湿度の高い林内ではもつと高い範囲まで及ぶ。本来の主幹生のものも、水流をもつ溪谷のような湿度の極めて高い、しかも適度の光のある常緑性林内では、その着生範囲は非常に高くなるのは不思議でない。樹幹の十数米の高さまで達するのは珍しくなく、樹冠内に達することさえある。同様な樹幹植生は、山岳の尾根すぢで、常に雲霧の去来するブナ林内でもみられる。例えば、由布山に近く、そしてまた、似た海拔高の福岡県英彦山、大分県中摩殿畑山では、大きなブナ幹の第一枝附近まで *Pterobryum arbuscula*, *Homaliodendron scalpellifolium*, *Macrosporiella scabriseta*, *Neckera konoi*, *Miyabea fruticella*, *Boulaya mittenii* 等が豊富にみられる。次いでブナの樹冠部には、*Macromitrium brachycladulum*, *Ulotia crispula*, *Dicranum hakkodense*, *Frullania* spp. 地衣類が多く、所謂の樹冠植生が発達する。

由布山頂上附近はブナ帯にありながらブナが生育せず、他の樹木は優性化し、または灌木で、高さはせいぜい 1 m 前後、高くても 3 m を出でない。従つて、この樹上に発達する蘚苔類植生は同様の海拔高に発達するブナ林の場合とは趣が違ふ。かような灌木の株元植生も普通の場合と違つて、株元植生に混つて、本来の主幹或は樹冠着生のものが降りてきており、更に地上までも及ぶことがある。前述の主幹生の大形の蘚類は *Boulaya mittenii* を除いては由布山頂ではみられない。樹枝上に特異な生活型をもっているものとしては、まず *Ulotia crispula* と *Dicranum hakkodense* とをあげることが出来よう。両種は西南日本では高い山の頂上附近に、しかも風が強く、たえず雲霧の去来するような亜高山的気象のところに好んで生育する。ともに樹冠生のものであるが、その着生部位は、この山頂では常に他の種の生育困難な上方の小枝の部分で、ウツギ類のように分枝の多いものの分枝部に pioneer として出はじめる。かような部分が、孢子その他の繁殖器官の着生するのに都合がよいであろう。他の多くの種も樹幹の節部、又は pioneer の座を足場として発育をはじめる。コウツギのように高さが 1 m 内外、太さが 1~2 cm 径の幹には *Ulotia*, *Dicranum*, *Frullania usamiensis*, が最初に発生するが (*Dicranum* は少い)、次第に他の種が侵入してくると、狭い区域内で競争がはじまり、殊に枝部に於て激しくなる。競争の結果優位にたつものは主茎をのばしてフンワリした生活型のもの、例えば *Boulaya*, *F. moniliata* subsp. *obscura*, *Entodon perichaetialis*, *Macromitrium brachycladulum*, *Lesquereuxia robusta*, *Meteo-*

riella soluta 等が見られる。従つて、*Ulota*, *Dicranum*, *F. usamiensis* は他の種の着生に困難な上方の小枝に追いやられることになる。これらの種は団塊状で内部に水分を保ち易いか、或は休と樹皮との間の湿気によつて、乾いた気象の下に生きることが出来る。こうして樹幹に着生した大型種も、強風にさらされて剥ぎ落されることもおこる。そうすれば、再び pioneer の植生からはじまることになる。

このように、由布頂上の灌木では *Ulota crispula*, *Dicranum hakkodense*, *Macromitrium brachycladulum*, *Frullania usamiensis* 等の樹冠部に生育する種が、地上 20~30 cm, 或はそれ以下の茎部に出てくる。即ち本来の主幹上の植生が単純になり、或は省略されて、せいぜい 1m 高の範囲に樹冠植生と僅の株元植生とが発達していることになる。又、株元植生を欠くことも多い。このように、主幹生の大型種が欠けているのは、これらの種が着生する程の太い幹のないことにも由るが、乾湿の差が大きく、又光量の多すぎることに由るものであろう。常緑樹のミヤマキリシマには、着生範囲の狭い関係もあろうが、着生蘚苔類はむしろ少い。*U. crispula* や *D. hakkodense*, 殊に前者は前に記したような特殊な生活型をもつていて、由布山ではよく落葉性灌木の小枝上の生活に耐えている。元来この両種と *Lesquereuxia robusta* とは温帯北部から亜寒帯にかけて分布の中心を有する種で、北日本のコメツガ、シラベ、アオモリトドマツのような常緑針葉樹の主幹に多くみられる。西南日本では低地の林内にみられず、山頂の小木上に出る。尤も、灌木の小枝に *U. crispula* が団塊をつくつて着生する見事な景観は近くの山岳、例えば、九重山、祖母山では見られず、ただ僅に散生しているにすぎない。祖母山では頂上まで灌木が密生し、九重山の場合は草原或は疎原化して、由布山頂のような環境に乏しい為である。由布山で落葉灌木の上に出来る植生は、本来なら高緯度地方にいくにつれて、光量の多いところを求めて発達するのが常態であろうが、これらの種の場合は逆になつてゐる。この解釈については、更に考察しなければならぬ問題を含んでいると思われる。

要 約

1. 由布岳頂上附近の蘚苔類植生は 1) 陽当りのよい岩上 2) 火口内の樹陰 3) 倭性樹上の 3 つに分けられる。
2. 草原中に点在する岩上、又は岩原には、火山性の山に多い *Andreaea rupestris* var. *fauriei*, *Rhacomitrium heterostichum*, *Rh. canescens* var. *ericoides*, *Rh. anomodontoides*, *Hypnum plumaeforme* が多い。
3. 旧火口内にはノリウツギが密生し、その林床には高地性の種が多い。
4. 倭性樹の枝には、moss ball をつくる *Ulota crispula* や *Dicranum hakkodense*, *Frullania usamiensis* が多く着生し、これらは地表近くにも及ぶ。主幹は小さく、*Ulota crispula*, *Dicranum hakkodense*, *Okamuraea hakoniensis*, *Entodon perichaetialis*, *Lesquereuxia robusta*, *Frullania usamiensis* 等が着生して、この地方の同高に発達するブナ幹の植生とは違う。倭性樹の株元には、この地方の株元に通常みられる種が乏しく、その代り主幹、又は樹冠部の種が出易い。従つて、倭性樹では本来の株元及び主幹植生が省略されていて、これは樹木が小さいのと、光の条件に左右されているものと思われる。
5. 倭性樹上に最初に生育してくるものは *Ulota crispula* と *Frullania usamiensis* で、その着生部位は分枝部及び古い枝跡からはじまる。このような種の蘚座が出来てから他の大型種が侵入する。しかし、大型種の多くは基物との結びつきが弱く、大きくなるにつれて風に吹き落されるようになって、再び pioneer の侵入から繰返される。
6. ツクシヤマナギやヤシヤブツのような滑かな、又分枝の少い幹には、樹上植生が出来にくい。

Summary

1. The present article deals with the bryophyte vegetation found on the summit of mt. Yufu, a volcano situated in the North-Eastern corner of Kyūshū, Japan (Lat. 131°40' N., Long.

33°30' E). It attains an altitude of about 1600 m above sea level.

2. The following bryophyte vegetation may be recognized: (1) Vegetation on sunny rocks, (2) vegetation on the floor in the deciduous broad-leaved forests developed in the crater, (3) vegetation on the dwarf trees or shrubs.

3. On the sunny and dry rocks (andesite) localized on the grassy slope, there are found several communities of *Rhacomitrium heterostichum*, *Rh. canescens* var. *ericoides*, *Rh. anomodontoides*, *Hypnum plumaeforme*, *Andreaea rupestris* var. *fauriei* which are found abundantly on volcanic mountains.

4. At the bottom of the crater as well as the inner slope surrounding the crater, dense forests of deciduous broad-leaved trees, predominated by *Hydrangea paniculata* attaining a height of 3~4 m are found. On the floor in the forests a considerable amount of montane bryophytes is found, such as *Hylocomium proliferum*, *H. calvescens*, *H. cavifolium*, *Golania varians*, *Polytrichum attenuatum*, *Pogonatum contortum*, *Marsupella parvixeta*, *M. tubulosa*, *Blepharostoma minus*, etc.

5. The small deciduous trees and shrubs, such as *Hydrangea paniculata*, *Deutzia scabra* var. *nakaii*, *Abelia serrata*, etc. and evergreen shrubs such as *Rhododendron kiusianum* grow abundantly on the peaks surrounding the crater and outer side slopes of the crater. The bryophyte communities on the small trunks and twigs of these trees are well defined. On the bases of these shrubs or small trees, those species (e.g. *Dolichomitriopsis diversiformis*, *Isothecium subdiversiforme*, *Hamaliodendron sculpellifolium*, etc.) usually occurring on the same part of large tree trunks in Kyūshū are hardly found but are covered thickly with those hanging or epiphytic species as *Meteoriella soluta*, *Pseudobarbella levieri*, *Lesquereuxia robusta*, etc. These species also grow on the moderately large tree trunks. The main but small trunks being 2~3 cm in diameter are also covered with *Entodon perichaetialis*, *Okamuraea hakoniensis*, *Lesquereuxia robusta*, but it seems to be too small for the full growth of these species. The community on the twigs of shrubs consists of those species as *Ulotia crispula*, *Dicranum hakkodense*, *Frullania usamiensis*. Of those, the first is the most abundant epiphyte and its moss balls on twigs present a characteristic sight (Figs. 2, 3). The *Ulotia-Frullania* community frequently extends downwards and grows near or on the bases of shrubs, under the circumstance that the tree bases are not preoccupied by other large bryophytes. This may be an interesting feature of the epiphytic communities. Such a community may be favoured by the good solar illumination as well as the small size of tree trunks. It is noteworthy that *Lesquereuxia robusta* occurring usually on rather shaded trunks of Gymnospermae in Northern Japan grows well on the strongly illuminated shrubs (Figs. 4, 5, 6).

6. On shrubs and small trees *Ulotia* and *Frullania* seem to be the pioneer. They germinate on the bases or on traces of twigs and gradually extend their cushions or mats. Large species seem unable to establish themselves on the trunk directly. The body of those species seems to come to anchor on the *Ulotia-Frullania* associule by a strong wind. Because most of those species rarely produce sporophytes. Then the *Ulotia-Frullania* associule tends to be ousted by those large species. However, the associules of large species cannot stand being exposed to a strong wind, and ultimately become stript from the trunks. Thus, an invasion of pioneers begins on the tree trunk again.

7. No bryophyte communities are found on such trees as *Salix harmsiana* and *Alnus firma*. This seems to be caused by the texture of bark, on which they grow.

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4. Richards, P. W. (1932)—Ecology, in Man. Bryol. 367~395.
5. ——— (1936)—Ecological observations on the Rain forest of mount Dulit, Sarawak. Pt. II. Journ. Ecol. 24: 340~360.
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Explanation of Plates

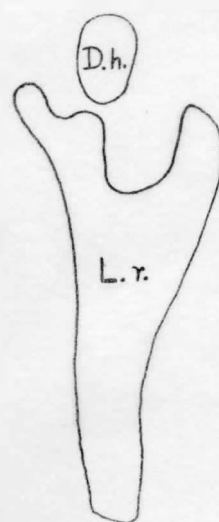
Pl. I

1. A peak of Mt. Yufu.
2. *Ulota-Frullania* associule on twigs of dwarf trees. *Lesquereuxia-Meteoriella-Boulaya* associules are also found near the base of tree.
3. *Ulota crispula* on twigs of shrub.
4. *Lesquereuxia robusta* (L. r.) and *Dicranum hakkodense* (D. h.) on twig of shrub.

Pl. II

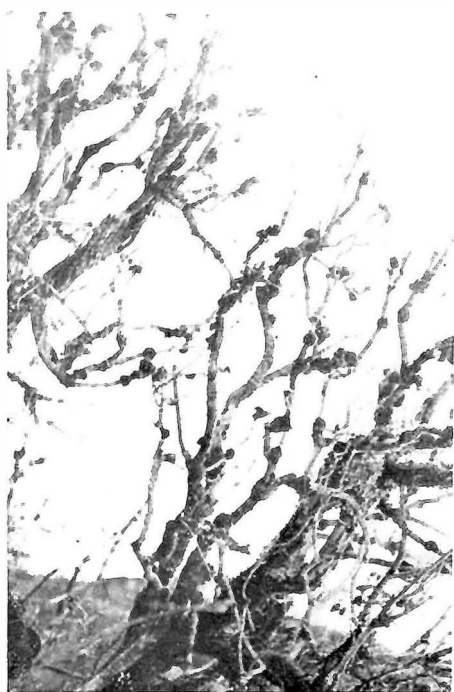
5. *Ulota crispula* (U. c.) and *Lesquereuxia robusta* (L. r.) on twigs of shrub.
6. *Ulota crispula* (U. c.), *Lesquereuxia robusta* (L. r.) and *Boulaya mittenii* (B. m.) on the trunk of shrub.
7. *Lesquereuxia robusta* (L. r.), *Meteoriella soluta* (M. s.), *Pseudobarbella levieri* (P. l.) and lichen (L.) on the basal part of dwarf tree.
8. *Dicranum hakkodense* (D. h.), *Okamuraea hakoniensis* (O. h.), *Entodon perichaetialis* (E. p.) and *Macromitrium brachycladulum* (M. b.) on twigs of shrub.

(The photographs were all taken in winter)





1



2



3



4



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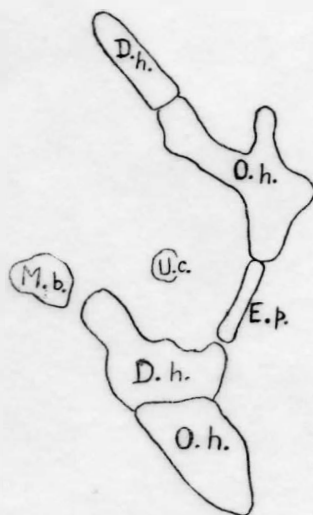
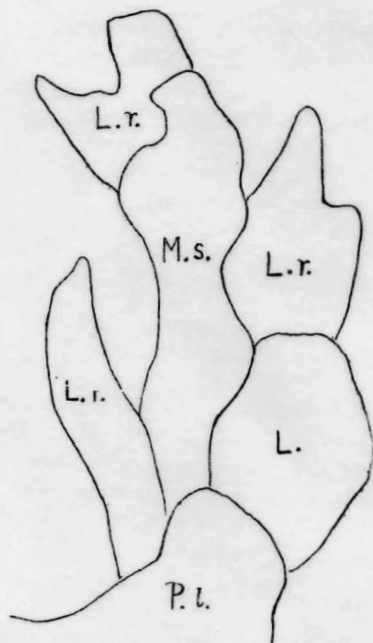
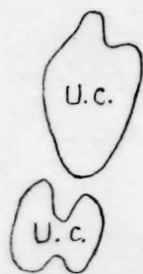
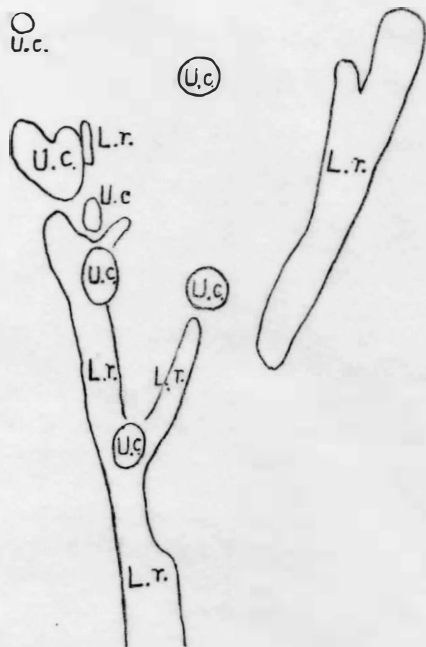
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8



NOTES ON THE HEPATICAE OF THE KINKI DISTRICT. I. TAENIOLEJEUNEA ZWICK.

By Tsutomu KODAMA¹⁾

児玉 務: 近畿地方産苔類小記 其一 イボヨウジョウゴケ属

In the Kinki district—middle-southern part of Japan—, only few localities for the species of *Taeniolejeunea* have been known. In the following pages, their detailed habitats and localities of six species are given, among which two species, *T. verdoornii* and *T. appressa* are new to Honshū, not only to the present area. *T. verdoornii* has hitherto been known only from southern Kyūshū (incl. Isl. Yakushima). On the other hand, *T. appressa* are widely distributed in southern Japan, Formosa, Andaman, Sumatra, Java, and yet disjunctively in Jamaica. In our area those so called “epiphyllous” Hepaticae usually occur on tree bases or lower portion of tree trunks, and rarely on rocks and leaves.

The specimens examined are all deposited in the writer's private herbarium, and the duplicates are in the herbarium of the Hattori Botanical Laboratory.

Here I wish to express my sincere thanks to Dr. S. Hattori who has kindly read and corrected the paper, and also to Messrs. T. Amakawa, Y. Ikegami, M. Kamimura and K. Okada for their help.

1) *Taeniolejeunea appressa* (Evs.) Zwick., in Ann. Bryol. 6:107 (1933); Hatt., in Journ. Jap. Bot. 17:461 (1941).—*Cololejeunea appressa* (Evs.) Benedix, in Fedde Repert. 134:31 (1953).

Specim. exam. Pref. Ōsaka: Mt. Iwawaki, ca 500 m, on trunk of *Illicium anisatum*, n. 3407, Mt. Inunaki, ca 250 m, on base of tree, n. 6511, n. 6579. Pref. Nara: Mt. Kasuga, ca 130 m, on base of *Acer formosum*, n. 6000, ibid. on trunk of *Cyclobalanopsis* sp., n. 6103, ibid. on base of *Podocarpus nagi*, n. 7712. Pref. Mie: Akane-kyō, near Nabari, ca 400 m, on trunk of *Cyclobalanopsis* sp., n. 6135, ibid. on base of *Actinodaphne lancifolia*, n. 6171, Hobara-mura Shirataki, ca 150 m, on base of tree, n. 5699, Ise-Onigajō, ca 150 m, on trunk, n. 5661, Ugura-mura Tōgū, ca 180 m, on rock, n. 5574, ibid. on tree base, n. 5565, Ōmadani, near Kinomoto, ca 200 m, on base of tree, n. 8010, n. 8015. Pref. Wakayama: Nachi, ca 150 m, on trunk, n. 7837, ibid. base of *Zelkova serrata*, n. 7854.

Range: Japan (Shikoku, Kyūshū, Yakushima), Formosa, Andaman, Sumatra, Java and Jamaica. New to Honshū!

2) *T. floccosa* (Lehm. et Lindenb.) Zwick. l.c.; Hatt., l.c. 462 (1941).—*Cololejeunea floccosa* (L. et L.) St. in Hedw. 29:18 (1890); Benedix l.c. 21 (1953).—*Leptocolea floccosa* (L. et L.) St., Spec. Hepat. 5:850 (1916); Horik., in Hikobia 1: 58 (1951).

Specim. exam. Pref. Ōsaka: Mt. Amano, ca 150 m, on trunk, n. 1475, Mt. Inunaki, ca 250 m, trunk of *Shiia sieboldii*, n. 6575. Pref. Nara: Mt. Kasuga, ca 100 m, on trunk of *Neolitsea aciculata*, n. 4985, ibid. ca 350 m, on trunk of *Acer formosum*, n. 6019. Pref. Mie: Gegū, ca 30 m, on trunk of *Antidesma japonicum*, n. 5413, ibid. on trunk of *Cyclobalanopsis glauca*, n. 5499, Ōmadani, near Kinomoto, ca 200 m, on trunk n. 8000.

Range: Japan (Honshū, Shikoku, Kyūshū), Ryūkyū, Formosa, Lingga Archip., Malacca, Java, Sumatra, Borneo, Celebes and the Philippines.

Benedix (1953) described a new species, *Cololejeunea (Taeniolejeunea) amoena*,

1) Ōsaka Municipal Museum of Natural History, also Hattori Botanical Laboratory.

which is closely related the present species. Our plants, particularly corticolous ones, are similar to *C. amoena* in its thick, pearl-shaped dorsal papillae of leaves. However, our plants have a single large disk cell at the base of leaf-lobules. This disk cell seems to be the most important feature to separate the present species from *C. amoena* Benedix.

3) *T. ocelloides* (Horik.) Hatt., l.c. 426 (1941)—*Leptocolea ocelloides* Horik. in Journ. Sci. Hiroshima Univ. Ser. B, Div. 2, 2:280 (1934), in Hikobia 1:58 (1951).

Specim. exam. Pref. Ōsaka: Minō, ca 150 m, on trunk of *Cyclobalanopsis* sp., n. 7353. Pref. Nara: Mt. Kasuga, ca 200 m, on base of *Podocarpus nagi*, n. 4947, ibid. ca 400 m, on trunk of *Tsuga sieboldii*, n. 6097, Tōnomine, ca 460 m, on base of *Cyclobalanopsis* sp., n. 7416. Pref. Mie: Akame-kyō, ca 400 m, on trunk of *Machilus japonica*, n. 6110, ibid. on base of *Acer formosum*, n. 6134, Gegū, ca 40 m, on leaves of *Ilex latifolia*, n. 5490, Ise-Onigajō, ca 150 m, on base of tree, n. 5660, Hobara, Shirataki, on trunk, n. 5698, Hanano-iwaya, near Kinomoto, ca 20 m, on base of *Podocarpus nagi*, n. 7946, ibid. on trunk of *Actinodaphne lancifolia*, n. 7997. Pref. Wakayama: Kitayama, Shinokawa-dani, ca 400 m, on leaves of *Elaphoglossum tosaense*, n. 836, Nachi, ca 150 m, on trunk, n. 7831.

Range: Japan (Honshu, Shikoku, Kyushu, Yakushima, Tsushima), Formosa.

4) *T. peraffinis* (Schiffn.) Zwick, l.c. 107.; Hatt. l.c. 463 (1941).—*Cololejeunea peraffinis* Schiffn. in Acad. Leop. 242 (1893); Benedix l.c. 34 (1953).—*Leptocolea peraffinis* (Schiffn.) Horik. l.c. 2: 280 (1934); in Hikobia 1:58, 83 (1951).

Specim. exam. Pref. Nara: Nara Park, 110 m, base of *Pieris japonica*, n. 4979, 5130.

Range: Japan (Honshū, Shikoku, Kyūshū, Yakushima), Formosa, Malacca, Java, Sumatra, Borneo, Celebes, the Philippines and India.

5) *T. pseudofloccosa* (Horik.) Hatt., l.c. 465 (1941).—*Leptocolea pseudofloccosa* Horik. l.c. 1:87 (1932); in Hikobia 1:58 (1951).—*Cololejeunea pseudofloccosa* (Horik.) Benedix, l.c. 36 (1953).

Specim. exam. Pref. Ōsaka: Minō, ca 150 m, on trunk of *Cyclobalanopsis glauca*, n. 7377, Mt. Iwawaki, on trunk of *Illicium anisatum*, n. 3406. Pref. Nara: Mt. Kasuga, ca 150 m, on trunk, n. 1746, ibid. ca 100 m, on trunk of *Pieris japonica*, n. 4983, ibid. ca 150 m, on trunk of *Ampelopsis leoides*, n. 5285, ibid. ca 150 m, on trunk of *Torreya nucifera*, n. 7692, Tōnomine, ca 460 m, on trunk of *Machilus japonica*, n. 7411, ibid. on trunk of *Acer formosum*, n. 7459, Honzawa, Mt. Ōdaigahara, ca 500 m, on leaves of *Lorogramme salicifolia*, n. 4649. Pref. Mie: Akame-kyō, ca 400 m, on trunk of *Tsuga sieboldii*, n. 6126, ibid. ca 500 m, on trunk of *Euptela polyandra*, n. 6189, Gegū, ca 30 m, on trunk of *Cyclobalanopsis glauca*, n. 5500, Mt. Asama, ca 500 m, on trunk of *Neolitsea aciculata*, n. 5789. Pref. Wakayama: Mt. Kōya, ca 800 m, on branch of *Viburnum tomentosum*, n. 6665, ibid. ca 600 m, on base of tree, n. 6824, Nachi, ca 150 m, on trunk, n. 7849.

Range: Japan (Honshū, Shikoku, Kyūshū, Yakushima), Formosa, Sumatra, Java, Borneo.

6) *T. verdoornii* Hatt. l.c. 459 (1941).

Specim. exam. Pref. Nara: Mt. Kasuga, ca 250 m, on base of tree, n. 5313, ibid. ca 350 m, on trunk of *Cyclobalanopsis* sp., n. 6005, ibid. on fallen trunk of *Acer* sp., n. 6018, ibid. on trunk of *Cryptomeria japonica*, n. 6025. Pref. Wakayama: Mt. Kōya, ca 800 m, on base of *Ilex crenata*, n. 6642, ibid. on trunk of *Cryptomeria japonica*, n. 6728, ibid. on trunk of *Pieris japonica*, n. 7777. Range: Japan (Kyūshū, Yakushima). New to Honshu!

近畿地方のイボヨウシヨウゴケ属として6種報告する。このうちジャバヨウシヨウゴケとイボヨウシヨウゴケ(本州新産)は稀にみられ、一般に前者は低地に、後者は山地に産する。他の4種(このうちヒラヨウシヨウゴケは本州新産)は近畿地方中部以南には割合広く分布し、オビナシヨウシヨウゴケは最も普遍的である。各種共本地域では湿度の高い溪谷の樹皮(特に裸出した樹根部に多い)時に葉上又は岩上にみられる。

日本着生蘚苔類フロアの研究¹

I. 溪側のヤマビワの着生蘚苔類群落

岩月善之助,² 服部新佐³

Zennoske IWATSUKI and Sinske HATTORI: Studies of the epiphytic moss flora of Japan. I. The moss community on *Meliosma rigida* along mountain stream.

欧米の着生蘚苔類に関する業績は近年とみに増加した。之に較べると我国に於ける研究は未だその緒についたばかりであるが、九州大学理学部生物学教室細川隆英教授及び同教室の小村精、西原幸男の諸氏に依り本格的に着手され、既に福岡県英彦山のブナ林の着生植物群落についての詳密な研究発表がある⁴。筆者の一人は熊本大学理学部生物学教室の野口彰教授と協力して宮崎県南部イス林のモミ樹幹の着生植物について報告した⁵。更に野口教授は宮本光生氏と共同で大分県由布山頂灌木叢の特殊な蘚苔類群落について詳しく調査された⁶。我国に於ける研究は凡そ以上に尽きようであるが⁷、既述細川教室その他の活潑な研究活動に依り、今後続々と業績が挙つてくると期待される。

筆者等は当市近郊の森林に於ける着生蘚苔類の研究に着手したが、そのねらいは筆者の一人が前掲モミ樹幹の蘚苔類報告中に述べた所を更に拡大したもので、終局的には日本着生蘚苔類フロアの完成にある。地理的位置、高度、地形、気象、所属群叢、その他樹木の立地条件、樹種、樹齡、樹高の異なるに従い、更に同一樹木に於てもその着生部位、方向などが異なるに従い、着生蘚苔類は種々異つて来る。極端な例を挙げると日本アルプス乃至北海道の高山頂上のハイマツ群落の着生蘚苔類は *Ptilidium pulcherrimum*, *Pt. californicum*, *Nipponolejeunea subalpina* など若干種(未発表)に過ぎないが、当市近郊の谷あいの疎林中のイチイガシ大木には1本の樹木に85種の蘚苔類(未発表)、約2km離れた溪谷のヤマビワ1本には67種を検出した(以下に報告)。然るにこの兩者の共通種は42種に過ぎず、種の構成は相当異つて居る。前掲モミ樹幹36種の蘚苔類と前2者との共通種は11種に減じ、その差は更に著しい。

先年 *Barbella* などの観察から竹内亮博士⁸ が指摘されたことがあるが、着生蘚苔類若干種の combinations を以て局地的気候の優秀な indicator として用いることが出来、更にこの方面の発展に依り我が国の森林を分類することが出来るであろう。筆者の一人に依つて屋久島の杉幹に *Anastrophyllum* の新種が見出され⁹、稀産と思われた *Frullania valida*¹⁰ がマメヅタランと共に当地山峻地帯のモミ樹幹上部の優占種であることが明らかにされた外、最近我々は *Frullania uvifera*¹¹ が当地カンシ林の樹冠部に広く分布すること、台北の一

¹ 本研究は文部省補助金によつて遂行された。²⁻³ 財団法人服部植物研究所。

⁴ 西原幸男、小村 精、細川隆英：英彦山のブナ林における着生植物群落について。植物生態学会報 3: 230-235 (1955)。

⁵ 服部新佐、野口 彰：モミ樹幹の蘚苔類について。服部植物研報 11: 93-99 (1954)。

⁶ 野口 彰、宮本光生：大分県由布山頂における蘚苔類の植生。大分県生物学会報 17: 1-10 (1955) 及び本誌 88 頁。

⁷ この報告印刷中に次の好著印刷を贈られた。中西 哲：森林の空間的なたちと着生蘚苔群落の分布について。広島大学生物学会誌 6: 18-23 (1955)。

⁸ 竹内 亮：多湿環境を示す美事なる着生蘚苔群を有する森林の一例について。地理学 5: 1089-1099 (1937)。

⁹ 植物研究雑誌 28: 141-144, Fig. 64 (1953)。 ¹⁰ 脚註 3 の文献 95 頁その他参照。

箇所で採集されただけの *Porotrichum gracilescens*¹² 等今迄当地域で採集されなかつた種類を樹上に発見した。

着生藓苔類は気象その他の環境条件を鋭敏に反映している点から、生態学的研究の対象として優秀な材料となることは勿論であるが、更にフロラとしても地上藓苔類に敢えて劣らぬ重要性が認められる。今後号を追つて我々の調査結果を発表するに当り、日本着生藓苔類フロラの研究なる標題を冠した所以である。

I. 溪側のヤマビワの着生藓苔類群落

1954 年夏季に連続して南九州を襲つた颱風は各地の森林に多くの被害を与え、当研究所

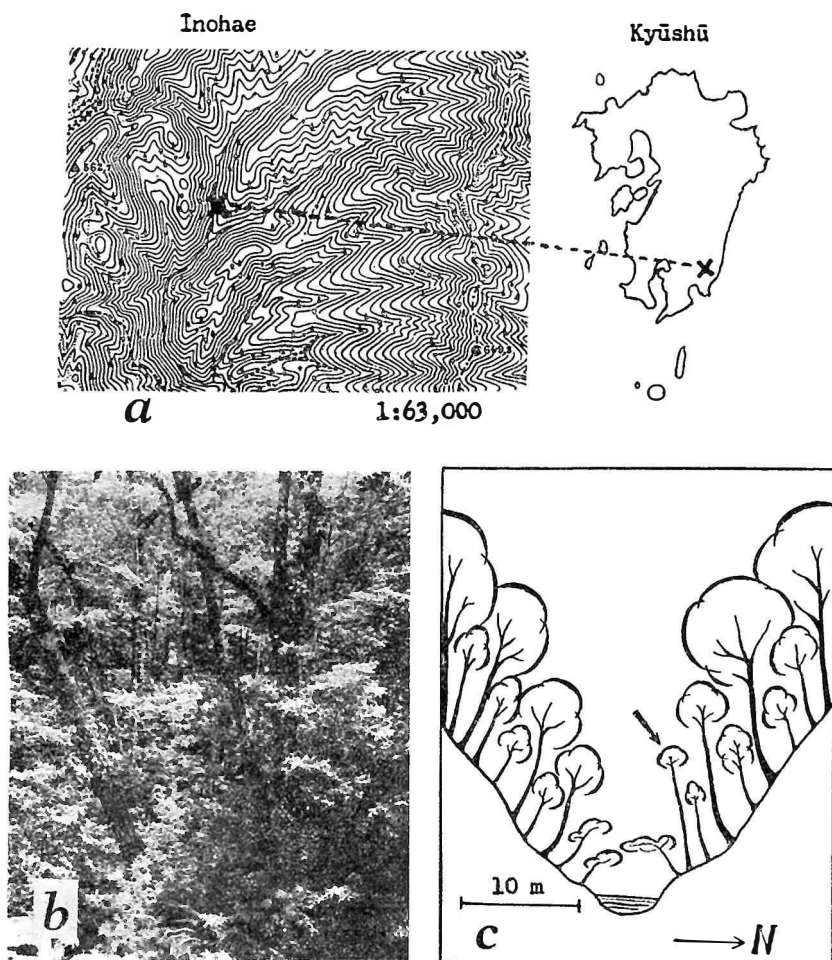


Fig. 1. a. Map showing the stand (x) investigated. b. Inohae Wood along a stream. Z. IWATSUKI photo. c. Idealized cross-section of (b). A mark (→) shows *Meliosma rigida*.

¹¹ 本種は小笠原島、屋久島及び大隅半島に於て数点採集されたのみ。

¹² Trans. Nat. Hist. Soc. Formosa 25: 66, t. 1 (1935). 本種は台北にのみ知られ日本には未記録の種であつた。本品は野口彰博士の同定を仰いだもので、詳細は同氏によつて近く発表の予定。

附近に於ても相当数の風倒木を出した。筆者等はこれらの風倒木を材料として平時には調査困難な樹冠部及び枝端の着生群落をも精細に調査する機会を得た。前述のモミは宮崎県南部の山稜上に生育して居たものであるが、此処では対照的に溪側に生育するヤマビワについて報告したい。

溪谷の周辺は湿度高く、環境が蘚苔類の生育に極めて有利であるため、多くの種が認められ、量もまた豊富である。溪谷に於ける此種の調査は従来殆んどなされて居らず森林内部の着生群落と比較したとき、多くの興味ある問題を含んで居る。

調査地点の環境並びに調査方法

調査したヤマビワは宮崎県南那珂郡北郷村猪の八重¹³の溪谷の北岸にある (Fig. 1)。調査地点の川床の巾は約 10 m あり、巾 5 m 程の溪流が東に流れ、両側の急斜面は岸近くまで常緑闊葉樹の密林である。この溪側林はカン類の優占する自然林で、第 1 層にはアラカシ、イチイガシ、ツクバネガシ、ウラジロガシ、シイ、ホソバタブ、イス、ヤマビワ等が見られ、第 2 層にはユズリハ、ハイノキ、タニワタリノキ、タイミンタチバナ等が多く、第 3 層に、イズセンリヨウ、ヤツデ、ジユズネノキ等が見られる。第 4 層には羊歯類が多くホソバカナワラビ、オオキジノオ、キジノオシダ、スジヒトツバ、シロヤマゼンマイ及びハナミヨウガを認めた。附近の樹枝には懸垂性の蘚類や葉上苔類が豊富に着生しアスマン氏吸気湿度計を用いて測定した結果、溪谷中央にて 95%、溪側にて 95~100% の値を得た (3 月、快晴正午)。

調査木は谷沿いの森林の最下部且つ南縁にはほぼ直立し、胸高周囲 44 cm、樹高 12 m であつて、第 1 枝は 10.5 m の高さより斜出、それより上部に直径約 3 m の小さな樹冠を形成する。従つて幹の大半は露出して溪谷内の気象変化に直接曝されると共に林内の樹幹に比し受光量が大きく、調査にあつては樹幹を 1 m 毎に区分し、溪流に面する開放された側と、森林内部に面する鬱閉された側を比較しつつ、そこに出現する総ての種及び被度を調査した。幹基部の群落は上部と較べて非常に異つていたので、特に最下部 0~20 cm を区別し、樹冠では主枝及び枝端を夫々別個に調査した。

尚、比較のため約 30 m 上流の溪流南岸に生育する他のヤマビワ 1 本 (12 m 長) をも同時に調査した。

調 査 結 果

精査の結果苔類 36 種、蘚類 31 種、地衣類数種及び高等植物 5 種計約 80 種の着生を認めた。此の数は樹高 12 m 程度の細い小喬木としては予想外に多いが、これは同地点の環境が蘚苔類の生育に極めて好条件であることを裏書きする。種数の多い半面、個々の種の被度は概して小さい。群落の組成は幹基部、幹中部及び樹冠部と夫々差異が認められるがその詳細は次の如くである。

A. 幹基部 (0~1 m) 地上 1 m までの部分は羊歯、草本及び小灌木の繁茂により受光量に乏しく、上部の群落と明らかに区別出来る。此の部分に蘚苔類 18 種を認めたが、その大半は通常岩上、地上乃至腐木上に着生し、樹幹に着生する場合は一般に基部近くに限られるものである。従つて純粹の着生植物とは考え難く、この点幹上部の着生植物群落とは異質的なものと云うことが出来る。

北側の暗い部分では *Plagioclila japonica* がその大半を覆い、南側では *Isothecium subdiversiforme* 及び *Leucoloma molle* の 2 種が優占する。*Pl. japonica*, *I. subdiversiforme* は何れも附近の陰湿な岩上に豊富に認められ、*L. molle* は明るい場所の腐木上にも

¹³ 此の附近は気温高く降水量も豊富で、宮崎測候所刊、気象便覧 1949 によれば、日南市における平均気温は 1 月 9.7°C、8 月 29.3°C、年 19.6°C で、降水量は年間 2749 mm である。

屢々見出される種である。他の 15 種は何れも微量で、上記の蘚苔類に混生して居るに過ぎない。

尚、基部 0~20 cm の部分は *Pl. japonica* が特に著しく、*I. subdiversiforme* もかなり豊富である。また周囲の土上から匍い上つたと考えられる **Bazzania japonica* がやや顕著で、少量の **Thuidium glaucinum*, **Archilejeunea kiushiana*, **Blepharostoma minus*, **Radula kojana* 等合計 8 種が認められる (* 印の種は 20 cm 以上には認められない種である)。

附近の森林内部では *L. molle*, *I. subdiversiforme*, *Homaliodendron scalpellifolium*, *Pl. japonica* 等が凡そ 2 m の高さまで旺盛に生育し、その着生量は南側に多く北側に少い。調査木ではこれらの種のうち *H. scalpellifolium* は痕跡的に認められたに過ぎず、他の種も 1 m 以下の部のみ顕著である。これは主として森林南縁にあつて受光量が比較的大きいことに起因すると考えられる。

B. 樹幹部 (1~10 m) 高さ 10.5 m まで枝なく主幹部の大半は露出するが、附近の矮小な樹木により多少遮蔽される下半分と比較的陽光にさらされる上半分とは、かなり群落の組成を異にして居る。従つて以下両者を別けて記述する。

a. 幹下半部 (1~5 m) 優占種は *Porotrichum gracilescens* で 1~4 m の部分に特に旺盛な発育を示す。次いで *Frullania makinoana*, *Endotrichella fauriei* がやや顕著である。*P. gracilescens* は明るい側に多く、やや大型の種であるがその群落はあまり密ではない。*Fr. makinoana* は一般に受光量の多い樹幹上に生育する種であり、*E. fauriei* は九州南部を北限とする大型種で附近の溪谷沿いの樹幹に着生する。

他に *Neckeropsis nitidula*, *Leucoloma okamurae*, *Neckera tosaensis*, *Dicranoloma fragiliforme*, *Taxithelium* sp. 等の小群落が認められる。これらの種の多くは葉が剛直で乾燥しても殆ど巻込まず、且つ光沢がある。一般に森林内樹の幹樹では日蔭を好む大型蘚 *Pterobryum arbuscula* が優占するケースが多いが、調査木では僅かに数本を見出した。その他微量年々前記の種に混生する多数の小型種が認められ、この部分の蘚苔類は全部で 30 種を越える。

b. 幹上半部 (5~10 m) 此の部分は受光量が大きで乾燥し易いためか、着生植物は量的に急激に減少し、樹幹の 3 分の 1 弱が覆われるに過ぎない。やや顕著な種は、比較的日光と乾燥に耐える *Spruceanthus semirepandus*, *Lopholejeunea subfusca* の 2 種であるが何れも被度 5% を越えない。その他少量年々 *Endotrichella fauriei*, *Pseudobarbella kiushiensis*, *Microlejeunea punctiformis* も広く認められる。他に 30 種近い蘚苔類を確認したが小型で地衣上や他の大型蘚の基部に断片的に見出されるものが多い。尚、此の部分の種の多くは、樹冠内或いは幹下半部にも僅かつて認められる。

C. 樹冠部 (10 m 以上) 枝葉により保護された樹冠内は、幹上半部と較べ受光量は少くなる。溪流側に位置し遙かに大きなカン類その他の常緑闊葉樹 (約 20 m) が近接して生え茂つて居るため独特の樹冠部群落が発達する。優占種は *Frullania aoshimensis* で *Myuriopsis sinica* が枝端部にやや顕著である。遙かに少量年々 *Endotrichella fauriei*, *Herpetineuron toccoe* 等も見出され、この部分の蘚苔類は総計 35 種である。然し年々 *Fr. aoshimensis* の如く、通例主幹部に見出される種が上昇して居ること、本来の樹冠部着生種が比較的少いことなどが眼につく。このことは *E. fauriei*, *Plagioclada yokogurensis*, *Cyatophorella hookeriana*, *Orthomniopsis japonica* その他についても云える。特に *C. hookeriana*, *O. japonica* の二種は西南日本の溪谷沿いの岩上及び樹幹下部に見出される種であるが、何れも樹冠部の *Endotrichella* の蘚座内に検出した。

Pseudobarbella, *Barbella*, *Neckera* のように空中湿度の高い場所に適応した形と考えられる懸垂性の種もかなり豊富である。*H. toccoe*, *M. sinica* の二種は長い鞭枝を形成し、何れも湿度の高い場所に見出される型である。その他この部分だけに見出した種として

Pycnolejeunea obtusilobula, *Frullania uvifera* (脚註 11 参照), *Lejeunea flava*, *Metzgeria fruticulosa*, *Taeniolejeunea ocelloides* 等がある。

附. 溪流南岸のヤマビワとの比較

以上は溪流北岸のヤマビワ (便宜上以下 A と称する) についての結果であるが、比較のため 30 m 程上流の南岸に生育するヤマビワ 1 本 (長さ約 12 m, 以下 B と称する) を調査したので、以下に簡単に比較して見よう。

B の生育地の upstream 約 40 m の距離に落差 20 m の滝があり附近の環境は陰湿である。加えて調査木の幹は直立せず約 45° の角度で溪流上に傾くため湿度は相当高くなつて居ると思われる。次に B の幹基部、主幹部及び枝端の 3 部の植生を A と比較しつつ簡単に述べる。

(1) 幹基部 (0~60 cm) 優占種は *Isothecium subdiversiforme* で根及び幹基部の大半を覆う。次いで、地上性の蘚 *Mnium trichomanes* 及び *Plagiothecium sylvaticum* の二種が傾斜した幹上面に豊富に認められる。これらの蘚に混生して、微量乍ら普通湿岩上に生ずる *Heteroscyphus argutus* が見出される。他に蘚類 20 種、苔類 6 種を確認したが、*I. diversiforme* などの優勢種に圧倒されて被度は何れも小さい。

(2) 主幹部 (60 cm 以上の幹及び大枝) 傾斜せる幹の上面には多量の蘚苔類が着生するが側面では急激に減少し下面には全く認められない。傾斜の甚しい主幹上面の優占種は *Mnium trichomanes* でその大半を覆う。側面では *Pseudobarbella kiushiuensis* が最も多い。その他部分的に *Dicranoloma fragiliforme*, *Endotrichella fauriei*, *Neckera tosaensis* 等がやや顕著である。苔類では陰湿な環境の樹幹に屢々見出される大型懸垂性の *Ptychanthus striatus* が側面に多い。大型種の少い部分には、小型で密着する *Lopholejeunea subfusca* が多く、*Spruceanthus semirepandus* も僅かに認められる。この他蘚苔類約 30 種を見出したが被度は何れも小さい。

(3) 枝端部 河床よりの高さ約 4 m 位の小枝 (径 5 cm 以下) を調べた。優占種は大型懸垂性の *Pseudobarbella kiushiuensis*, *P. mollissima* の二種で、小型で樹皮に密着する *Frullania aoshimensis* がこれに次ぐ。*Ptychanthus striatus* もかなり認められる。他に蘚苔類 10 種を検出したが何れも微量であつた。

以上の如く A, B 両者の間にかかなりの違いを認めたが、その原因を以下に考察して見よう。

(1) 着生蘚苔類の種類には大差ないが、B に着生する種のうち約 20 種は A では認められなかつた種である¹⁴。これらの種の多くは日陰或いは湿度の高い場所を好むもので環境の差を鋭敏に表わして居る。又被度は B では非常に高く且つ大型蘚が各部分で優占するに対し、A では被度も小さく、大型蘚の優占もあまり顕著でない。

更に B では小型密着性の苔類は、大型蘚に圧迫されて、種数、被度共に減少する。今苔類を 1 とした時の蘚苔両者の種数比を挙げると、A では 1:0.85, B では 1:1.6 となりかなりの差が認められる。蘚苔を通じ、A で優占した種の被度は B では非常に貧弱となる。A の幹基部での優占種 *Plagiochila japonica* は B では痕跡程度見出されたに過ぎず、幹部の優占種 *Porotrichum gracilescens* は B では全く認められない。

これらの原因としては、大型蘚との競争と共に、光及び湿度条件の変化が重視される。B は溪流南岸、滝近くにあるため受光量が少く、且つ湿度が高くなる結果 A と較べ種の構成並びに被度にこの様な大きな違いが現れたと考えられる。

¹⁴ *Chrysocladium retrorsum*, *Fissidens adiantoides*, *F. gymnogynus*, *Hypopterygium japonicum*, *Hypnum tristo-viride*, *Meteorium helminthocladum*, *Mnium trichomanes*, *Okamuraea hakoniensis*, *O. plicata*, *Pilotrichopsis dentata*, *Plagiothecium sylvaticum*, *Pseudobarbella assimilis*, *Dendroceros japonicus*, *Heteroscyphus argutus*, *Lejeunea boninensis*, *L. vaginata*, *Porella perrottetiana*, *Radula acuminata*, 及び *Spruceanthus polymorphus* の 19 種。

Table 1. Epiphytic community on *Meliosma rigida*, showing the

| Species | Height (m) | | | | | | | | | | | | large branches | small branches |
|--|------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|------|-------|----------------|----------------|
| | —0.2 | 0.2—1 | 1—2 | 2—3 | 3—4 | 4—5 | 5—6 | 6—7 | 7—8 | 8—9 | 9—10 | 10—11 | | |
| <i>Archilejeunea kiushiana</i> | + | | | | | | | | | | | | | |
| <i>Blepharostoma minus</i> | + | | | | | | | | | | | | | |
| <i>Thuidium glaucinum</i> | + | | | | | | | | | | | | | |
| <i>Bazzania japonica</i> | 1 | | | | | | | | | | | | | |
| <i>Radula kojana</i> | + | + | | | | | | | | | | | | |
| <i>Plagiochila japonica</i> | 3 | 2 | + | + | + | | | | | | | | | |
| <i>Isoetecium subdiversiforme</i> | 1 | 2 | + | + | + | + | | | + | | | + | | |
| <i>Dicranoloma fragiliforme</i> | + | | 1 | | | + | | + | + | + | + | + | | |
| <i>Lejeunea japonica</i> | | + | | | | | | | | | | | | |
| <i>Homaliodendron exiguum</i> | | + | | | | | | | | | | | | |
| <i>Homaliodendron scalpellifolium</i> | | + | | | | | | | | | | | | |
| <i>Claopodium assurgens</i> | | + | + | | | | | | | | | | | |
| <i>Leucoloma molle</i> | | 3 | + | | | | | | | | | | | |
| <i>Neckeropsis nitidula</i> | | + | 2 | 1 | | + | | | | | | | | |
| <i>Frullania makinoana</i> | | + | 1 | 2 | 2 | 2 | 1 | | | | | | | |
| <i>Radula variabilis</i> | | + | | | | | | | + | | + | | + | |
| <i>Aërobryopsis subdivergens</i> | | + | + | | | + | | | | + | + | | | + |
| <i>Pseudobarbella kiushiuensis</i> | | + | + | | + | | | | + | + | + | + | 1 | 1 |
| <i>Cololejeunea shikokiana</i> var. <i>subacuta</i> | | | + | | | | | | | | | | | |
| <i>Barbella pendula</i> | | | + | | | | | | | | | | | |
| <i>Neckera tosaensis</i> | | | 1 | | | | | | | | | | | |
| <i>Porotrichum gracilescens</i> | | | 3 | 3 | 2 | 1 | | | | | | | | |
| <i>Taxithelium</i> sp. | | | + | 1 | + | + | + | 1 | | | | | | |
| <i>Taenirolejeunea appressa</i> | | | + | | | | | | | | + | | | |
| <i>Metzgeria conjugata</i> var. <i>japonica</i> | | | + | + | + | | | | | + | | | + | |
| <i>Lopholejeunea subfusca</i> | | | + | + | + | | + | 1 | 1 | + | + | + | + | |
| <i>Cyathophorella hookeriana</i> | | | + | | | | | | | | | | + | + |
| <i>Pycnolejeunea imbricata</i> | | | + | | + | | | | | + | + | + | | 1 |
| <i>Lejeunea pallide-virens</i> | | | + | + | + | + | + | + | | + | + | | + | + |
| <i>Leucoloma okamuræ</i> | | | | + | 1 | 1 | | | | | | | | |
| <i>Sematophyllum</i> sp. | | | | + | + | + | + | | | | | | | |
| <i>Drepanolejeunea tenuis</i> | | | | + | | | + | + | + | + | | + | | |
| <i>Fauriella tenuis</i> | | | | + | | + | + | + | + | + | + | | | + |
| <i>Endotrichella fauriei</i> | | | | + | 1 | 1 | 1 | + | + | + | + | + | + | + |
| <i>Spruceanthus semirepandus</i> | | | | + | + | | + | 1 | 1 | 1 | 1 | + | + | + |
| <i>Microlejeunea punctiformis</i> | | | | + | + | + | + | + | + | + | + | + | + | + |
| <i>Pterobryum arbuscula</i> | | | | | + | | | | | | | | | |

* To show the cover degree of each species, the following figures have been used:

vertical distributions and the value of cover degree of each species.*

| Species | Height (m) | | | | | | | | | | | | large branches | small branches | | |
|--|------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|------|-------|----------------|----------------|-------|-----|
| | 0—0.2 | 0.2—1 | 1—2 | 2—3 | 3—4 | 4—5 | 5—6 | 6—7 | 7—8 | 8—9 | 9—10 | 10—11 | | | 11—12 | |
| <i>Haplocladium</i> sp. | | | | | + | | | | | | | | | | | |
| <i>Frullania aoshimensis</i> | | | | | + | + | | | + | | + | 2 | 1 | 2 | 2 | |
| <i>Leptolejeunea subacuta</i> | | | | | | + | | | | | + | | | + | | |
| <i>Radula oyamensis</i> | | | | | | + | + | + | | + | | + | | + | + | |
| <i>Myuriopsis sinica</i> var. <i>flagellifera</i> | | | | | | + | + | + | + | + | | + | + | 1 | 2 | |
| <i>Lophocolea minor</i> | | | | | | | + | | | | | | | | | |
| <i>Leucobryum bowringii</i> | | | | | | | + | | | | | | | | | |
| <i>Drepanolejeunea serrulata</i> | | | | | | | + | | | | | + | | + | | |
| <i>Barbella asperifolia</i> | | | | | | | + | + | | | | | | | + | |
| <i>Ptychanthus striatus</i> | | | | | | | | + | | | | | | | | |
| <i>Frullania densiloba</i> | | | | | | | | | + | | | | | + | | |
| <i>Drepanolejeunea japonica</i> | | | | | | | | + | | | | | | | | |
| <i>Schlotheimia latifolia</i> | | | | | | | | | + | | | | | | | |
| <i>Frullania moniliata</i> subsp. <i>obscura</i> | | | | | | | | | + | + | + | | | + | + | |
| <i>Herpetineuron toccoe</i> | | | | | | | | | | + | | | + | + | + | |
| <i>Brachiolejeunea sandvicensis</i> | | | | | | | | | | | | + | | | | |
| <i>Frullania diversiteria</i> | | | | | | | | | | | | + | | | | |
| <i>Trachypus humilis</i> | | | | | | | | | | | | + | | | | |
| <i>Haplohypnum microphyllum</i> | | | | | | | | | | | | + | + | + | | |
| <i>Taeniolejeunea pseudofloccosa</i> | | | | | | | | | | | | | + | | | |
| <i>Neckera nakazimae</i> | | | | | | | | | | | | + | 1 | | | |
| <i>Plagiochila yokogurensis</i> | | | | | | | | | | | | | + | + | + | |
| <i>Orthomniopsis japonica</i> | | | | | | | | | | | | | | + | | |
| <i>Pycnolejeunea obtusilobula</i> | | | | | | | | | | | | | | + | | |
| <i>Frullania fauriana</i> | | | | | | | | | | | | | | + | + | |
| <i>Frullania uvifera</i> | | | | | | | | | | | | | | | + | |
| <i>Lejeunea flava</i> | | | | | | | | | | | | | | | + | |
| <i>Metzgeria fruticulosa</i> | | | | | | | | | | | | | | | + | |
| <i>Taeniolejeunea ocelloides</i> | | | | | | | | | | | | | | | + | |
| <i>Pseudobarbella mollissima</i> | | | | | | | | | | | | | | | + | |
| (ferns and fern allies) | + | | + | | | | | | | | | | | | | |
| <i>Loxogramme fauriei</i> | | | + | | | | | | | | | | | | | |
| <i>Trichomanes bipunctatum</i> | | | + | | | | | | | | | | | | | |
| <i>Trichomanes parvulum</i> | | | | | | | | | | | | + | + | | | |
| (orchid) | | | | | | | | | | | | | | | | |
| <i>Bulbophyllum japonicum</i> | | | + | | | | | | | | | | | | | |
| (lichens) | | | | | | (+) | (+) | (1) | (1) | (1) | (1) | (1) | (+) | (+) | (1) | (+) |

+.....below 1%; 1.....1-5%; 2.....5-25%; 3.....25-50%; 4.....50-75%; 5.....75-100%.

(2) B は主幹部が相当傾斜して居り、幹の上・下両面の着生量に大きな違いが認められる。上面は humus が浅く堆積して大型蘚が密生し、被度が大であつて地上生の数種の蘚類 *Mnium trichomanes*, *Plagiothecium sylvaticum*, 及び *Fissidens adiantoides* 等が相当量着生する。これに対し、下面には全く着生蘚苔類は認められない。一般にかかる上・下両面の差は傾斜の甚だしい幹乃至大きな枝に多かれ少なかれ認められるものであつて、その原因の第一として下面は雨水などが充分に行き渡らず、殆ど常に乾燥すること、第二に光条件の不利によるものと考えられる。

終りに臨み困難な蘚類若干の同定を賜つた野口彰博士、樹木の同定に関し御教示を得た前川友夫博士に深く感謝する。

Summary

We have, at present, a few reports on the epiphytic moss communities in Japan, as the study on such problem as this is just dawning in this country.

The authors are studying on epiphytic moss communities under different environments in various districts, in order to make clear the epiphytic moss flora of Japan.

They examined the epiphytic moss communities on a *Meliosma rigida* (12 m height) which was fallen down by a typhoon which attacked in the summer, 1954. The tree stood on the northern side of a mountain stream, ca. 250 m above sea level, Inohae, Miyazaki Prefecture, southern Kyūshū, Lat. 31°40' N., Long. 131°15' E. (see Fig. 1, a). The forest which surrounds the present tree consists of broad-leaved evergreens. Among them, *Quercus* spp. (*Q. stenophylla*, *Q. glauca*, *Q. gilva*) are dominant. The epiphyte community of this tree comprises 36 species of hepaticae, 31 species of musci, several species of lichens, 3 species of ferns and fern allies and a species of epiphytic orchid.

The authors recognized the following three communities (see, Table 1).

A. **Trunk base** (0-1 m height) This portion is considerably protected from a solar illumination by ferns, herbs and shrubs. The dominant species in this portion were *Plagiochila japonica* on the north side and *Isoetecium subdiversiforme* and *Leucoloma molle* on the south side. Besides, we found 15 species on the trunk base. However, almost all of these bryophytes may hardly be regarded as a real epiphyte, because they were abundantly found also on decaying logs, forest floor and on rocks in the present area. Thus the moss community on the trunk base is essentially differs from the upper portion of the tree.

B. **Trunk**. This portion is exposed to a humid wind and good solar illumination. Here we recognized 2 different communities, the lower portion (up to 5 m) and the upper portion (5-10 m).

(a) **The lower portion of trunk** (up to 5 m). The dominant species was *Porotrichum gracilescens*. *Frullania makinoana* and *Endotrichella fauriei* were subdominant. In addition, there were many other small patches of mosses mostly consisting of *Neckeropsis nitidula*, *Leucoloma okamurae*, *Neckera tosaensis*, *Dicranoloma fragiliforme*, and *Taritelium* sp. *Pterobryum arbuscula* which usually occurs on the lower portion of trunks in the montane forest, was scarcely found here. We found here about thirty species in total.

(b) **The upper portion of trunk** (5-10 m height). There were no dominant species on this portion. The moss community was rather poor being influenced by a stronger solar illumination. However, there were more than 25 species of mosses which could stand to a strong illumination and desiccation. Among them, *Spruceanthus semirepandus* and *Lopholejeunea subfusca* were fairly abundant.

C. **Crown** (10-12 m height). More than 30 species of mosses were found on this portion. The dominant species was *Frullania aoshimensis*. In more or less sunny places the present species was usually found on the lower portion of tree trunks. *Myuriopsis sinica*

was subdominant, growing preferably on the twigs. The moss community consists chiefly of those species which usually occur on the lower portion of trunks in the evergreen forest of S. Japan. *Endotrichella fauriei* and *Cyathophorella hookeriana* were representative of such species. Many pendulous mosses, *Barbella*, *Pseudobarbella* and *Neckera*, were also found in this portion, due to the moist condition along the mountain stream.

The authors have found such rare species on this tree, as *Porotrichum gracilescens* and *Frullania uvifera*. The former has hitherto been collected only once in the northern Formosa, and the latter in the several localities in Isls. Bonin, Yakushima, and Osumi Pen.

For comparison, another *Meliosma* bole standing on the opposite side of the stream, was examined, and also the moss communities on different trees as well as on wood floor and rocks, were observed and discussed.

蘚類の染色体研究. I.

三 宮 正 信¹⁾

Masanobu SANNOIYA: Chromosome studies of Mosses. I.

蘚類の核学的研究は多くの人々によつてなされており、中でも Shimotomai u. Koyama (1932), Shimotomai u. Kimura (1934), Kurita (1937), 辰野 (1953), 矢野 (1953, 1954), Lowry (1954) 等は性染色体を報告し, Heitz (1928), Jachymusky (1935), 辰野 (1951, 1953), 矢野 (1951, 1952, 1953, 1954) は異質染色体の存在を明らかにしている. 又辰野, 矢野等は核型の研究をも行い, 更に一部の蘚類について, 同属のものは同一染色体数を有することや異数性, 倍数性のあること, 又倍数性と性との関係等を報告している. 筆者も二, 三の蘚類について染色体の観察を行つたので, 結果をここに報告する.

材料及び方法

本研究に用いた材料は第 I 表に示す通りである. 染色体は孢子母細胞を醋酸オルセインにより直接染色して観察した.

第 I 表 (Table I)

| Species examined | Numbers of bivalent | Localities |
|---|---------------------|---|
| Hylocomiaceae <i>Hylocomium cavifolium</i> Lac. | 6II | Fukayabakei, Oita-Pref. |
| Brachytheciaceae <i>Brachythecium buchanani</i> (Hook.) Jaeg. <i>Myuroclada concinna</i> (Wils.) Besch. | 10II 11II | " " |
| Neckeraceae <i>Thamnium sandei</i> Besch. | 11II | " |
| Fissidentaceae <i>Fissidens cristatus</i> Wils. | 16II | " |
| Pottiaceae <i>Weisia longidens</i> Card. <i>W. viridula</i> (L.) Hedw. | 13II 13II | Mt. Yufu, Oita-Pref. Oita-City, Oita-Pref. |
| Entodontaceae <i>Entodon challengerii</i> Par. | 11II | " |
| Bryaceae <i>Bryum caespiticiu</i> L. | 20II | " |

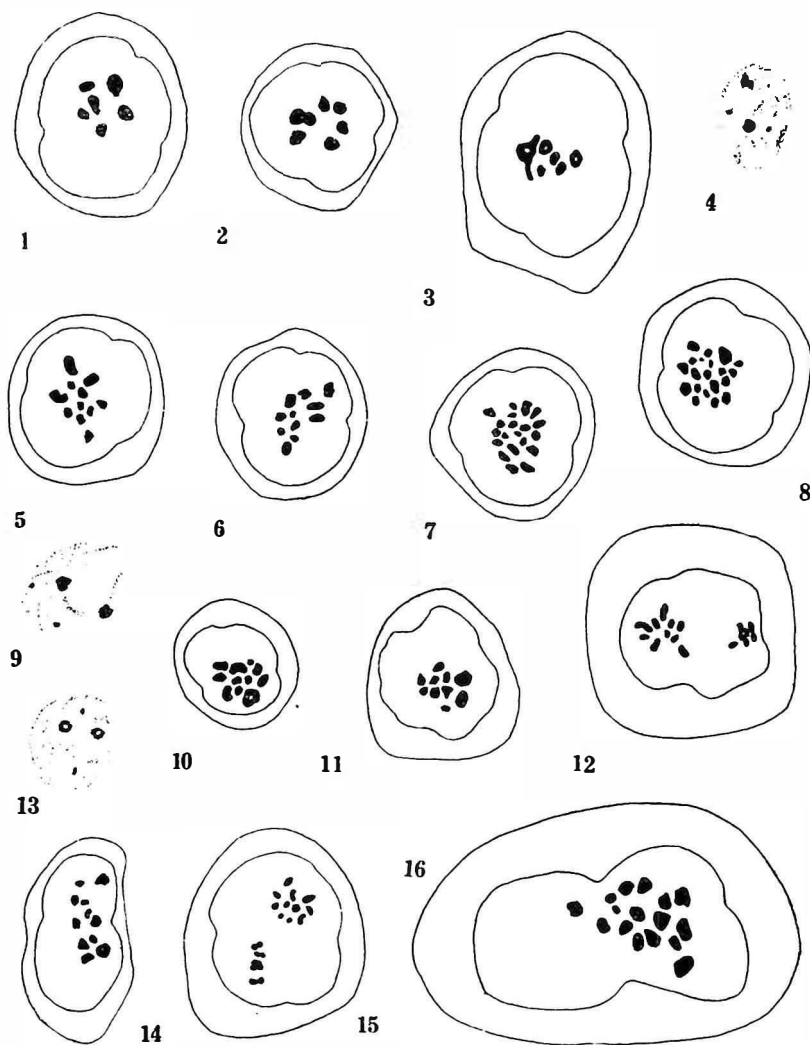
観 察

減数第一分裂中期に於いてなされた観察の結果は Figs. 1-24 に, 又それらの染色体数は第 I 表に示してある. 染色体は *Weisia viridula* 及び *W. longidens* の一対宛を除いては

1) 大分大学学芸学部生物学教室

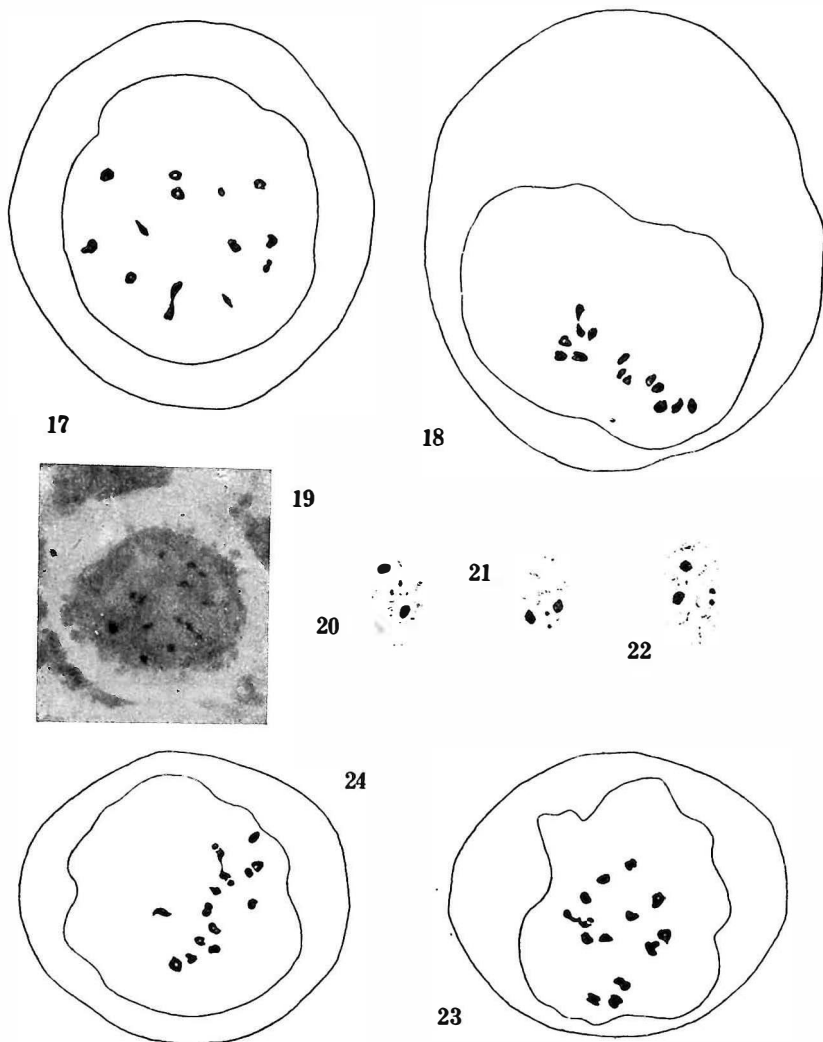
環状、類球状又は短い棒状を呈している。第一分裂前期の初め及び sporophyte の休止核中には 4 個の異常凝縮がある。これらを中期まで追求することは出来なかつたが、その中 2 個は大型で他の 2 個は小型である (Figs. 4, 9, 13, 20, 21, 22).

矢野 (1952) は *Fissidens*, *Dicranum*, *Thuidium* 等で同一属のものは同一染色体数を有することを指摘したが、*Weisia* 属の 2 種即ち *W. viridula* 及び *W. longidens* もこの新たな例と共に 13II を示した。*Fissidens cristatus* について、矢野 (1951) は雌株で、 $n=16$



Figs. 1-16. 蘚類 7 種の減数分裂と胞子体細胞の異常凝縮 (Meiotic chromosomes in SMC's and heteropycnosis within of interkinesis nuclei in sporophotes) 1-4. *Hylocomium cavifolium*. 5, 6. *Myuroclada concinna*. 7, 8. *Bryum caespiticium*. 9, 10. *Thamniurn sandei*. 11-13. *Brachythecium buehanani*. 14, 15. *Entodon challengerii*. 16. *Fissidens cristatus*. $\times 1800$.

$=14+H+1$ と報告しているが筆者の算定もこれと一致し 16_{II} を認めた (Fig. 16). *Hylocomium cavifolium* は 6_{II} (Figs. 1-3) で矢野 (印刷中) を確かめた. *Brachythecium buehnanani* は 10_{II} (Figs. 11, 12) で矢野 (1954) の *Brachythecium buehnanani* var. *japonicum* $n=10$ と同数である. *Myuroclada concinna* の染色体数については栗田 (1950) は $n=10$ と発表しているが, 筆者 (本研究) の大分県深耶馬溪産のものは 11_{II} であつた (Figs. 5, 6). 尚矢野も本種で $n=11$ を算定している (未発表). *Thamniun sandei* について, 矢野 (1953) は monoploid は, 雌雄異株で $n=11=H+h+9$, diploid は雌雄同株で $n=22=2H+2h+18$



Figs. 17-24. 蘚類 2 種の減数分裂と胞子体細胞の異常凝縮 (Meiotic chromosomes in SMC's and heteropycnosis within of interkinesis nuclei in sporophytes) 17-21. *Weisia longidens*. 22-24. *W. viridula*. $\times 1800$.

としている。筆者のものは 11_{II} (Fig. 10) で monoploid に相当するものであろう。 *Entodon challengerii* は 11_{II} (Figs. 14, 15) で矢野 (1952) の *E. chloroticus* 及び *E. flaccidus* と同数である。尚矢野も本種で $n=11$ を算定している (印刷中)。

Bryum caespiticium については Wettstein (1924) は $n=10$, Griesinger は $n=10$ and 20 としており種内倍数性のあることを示している。亦矢野 (未発表) は新潟県産の本種で $n=10$ を見ている、筆者の大分県産のものでは 20_{II} (Figs. 7, 8) であつたので本邦産の本種にも種内倍数性のあることが明らかとなつた。

Weisia viridula 及び *W. longidens* の 2 種は何れも 13_{II} (Figs. 17-24) である。その中一対は末端接合をしている大型の染色体で、胞子母細胞第一分裂において極えの移行がしばしば他に前後する (Figs. 18, 24)。

考 察

胞子母細胞第一分裂前期の核中にも大部分の種を通じて、大小 2 個ずつ計 4 個の異常凝縮が見られることを先に述べた。一方辰野 (1951, 1953) 及び矢野 (1951, 1952, 1953, 1954) は多くの蘚類で核板中最大及び最小の染色体はそれぞれ異質染色体 H 及び h であることを報告している。従つて筆者の場合も上記の大小の染色質塊はそれぞれ $H-H$ 及び $h-h$ の対合したものであろうと推定される。

Fissidens cristatus, *Thamnum sandei*, *Brachythecium buchanani*, *Myuroclada concinna*, *Entodon challengerii*, *Bryum caespiticium* の各種は一般的には雌雄異株とされているが、減数第一分裂を通じて不等対は認められないので性染色体の分化はないものと推定される。

Weisia 属の *W. controversa*²⁾ で Vaarama (1950) は $n=14$ とし更に減数第一分裂の後期に chromatid が環境の影響をうけて顕著な分離をすることを報告している。又 W. C. Steere and others (1954) はいろいろな環境に生育する植物体で常に $n=13$ であることを報告しているが、大分県産のものは染色体数は後者の場合と一致している。更に、第一分裂後期の顕著な分離は環境の影響によるものではなくて、末端接合をする特異な大型の bivalent は $H-H$ の対合によるものと推定され、異質染色体であるために起るものと考えられる。尚 *W. longidens* の場合も全くこれと同様であろう。

終りに臨み本研究の遂行に当つて終始御懇篤なる御指導をいただいた広島大学理学部辰野誠次博士、熊本大学理学部野口彰博士、また特に校閲の労を賜つた新潟大学高田分校の矢野孝二先生に対し深甚なる謝意を表する。

Summary

1. Nine species of mosses were investigated cytologically with special reference to the chromosome number. The results obtained are shown in Figures 1-24 and Table I.
2. In the first prophase of almost every species studied by the author, were found four heteropycnosis, of which two are larger than the other two.
3. In the metaphase of *Weisia viridula* and *W. longidens*, the longest pair of meiotic chromosomes are observed, and these are to be $H-H$.

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BRYOLOGICAL MISCELLANIES. 1-3.

By Zennoske IWATSUKI¹⁾

岩月善之助：蘚苔類雜記 1-3.

1. Two species of *Fissidens* newly found in Japanese territory.

Last summer I collected the following two species of the section *Bryoidium* of *Fissidens* in the Island of Rishiri which is situated 16 km. west of the Sōya Pen., Hokkaidō, roughly Long. 141°30'E., Lat. 45°N., that is the northernmost border of the Japanese territory. They occur on the surface of andesite under a coniferous forest where *Picea jezoensis* and *Abies sachalinensis* are dominant. After careful examinations, both species have been proved to be new additions to the bryological flora of Japan.

Fissidens minutulus Sull. in Mem. Am. Acad. n. s. 3:58, pl. 2 (1848).

Hab. On wet surface of andesite, often submerged, along a stream, under the coniferous forest, 100 m above sea, at Oshidomari, Isl. Rishiri, Hokkaidō (coll. Z. Iwatsuki no. 15208, August 8, 1954).

Range: Europe, North America. New to Japan!

This species has a strong resemblance to *F. angusti-limbatus* Broth. in general aspect. The latter species was described by a specimen collected in Yokohama, and afterward reported in several other localities in central Japan. However, the present species is distinct by having less serrate leaf apices, and shorter stems.

In the Rishiri plants, the perichaetial leaves are long and narrowly lanceolate, the stem-leaves usually in 3-5 pairs. Its border is narrow and seen only in the upper leaves, mostly ending far below the apex.

Fissidens bryoides Hedw. in Sp. Musc. 135 (1801).

Hab. In a tuft of *Pleurochaete* sp. on andesite surface in a shady place along a stream, under the coniferous forest, 300 m above sea, at Oshidomari, Isl. Rishiri, Hokkaidō (coll. Z. Iwatsuki no. 15220, August 8, 1954)

Range: Europe, N. America, Caucasus, Himalaya, Siberia, China. New to Japan!

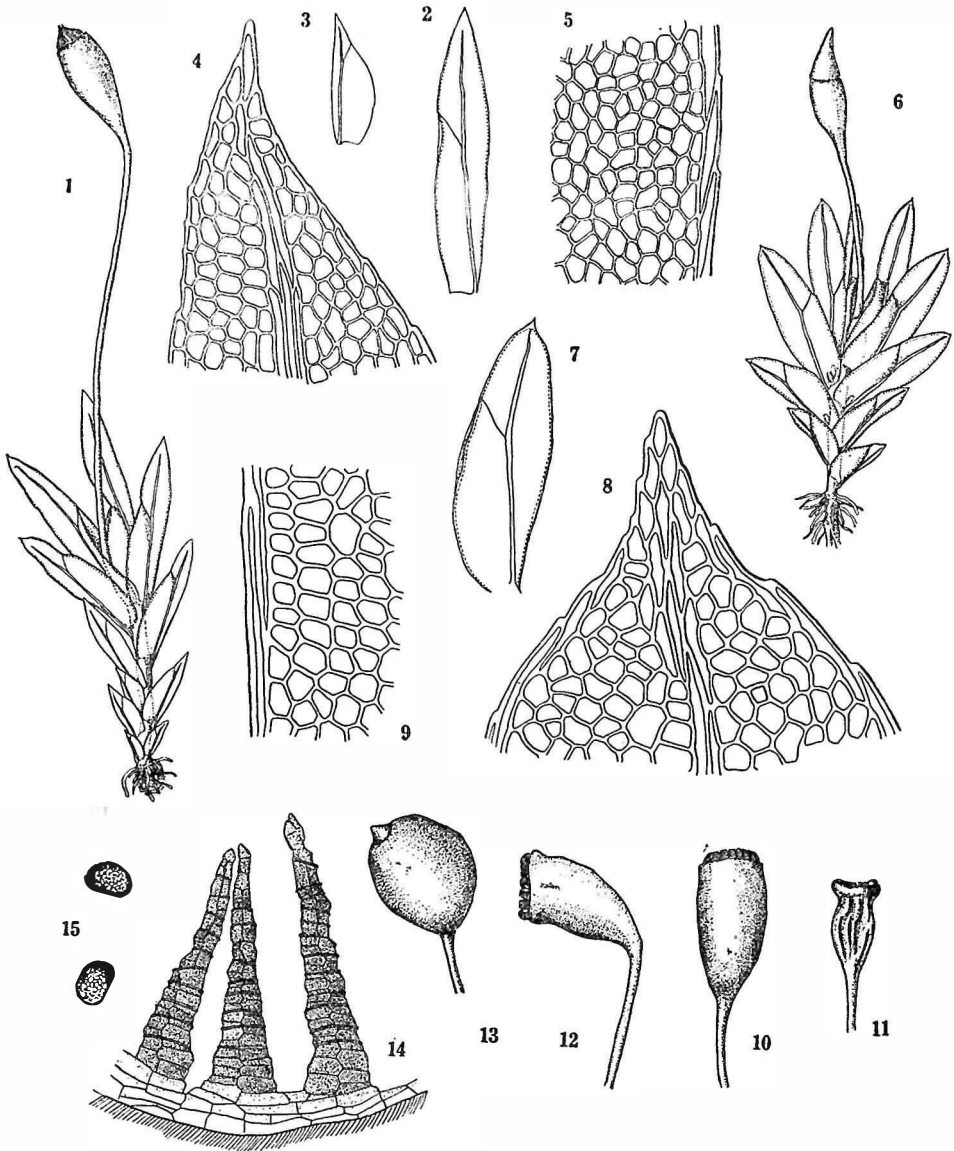
The present species is closely related to *F. tosaensis*²⁾ in many respects. *F. tosaensis* was described by V.F. Brotherus based on Okamura's collection. It is widely distributed in the southern part of Japan. However, comparing carefully the original material of *F. tosaensis* with some authentic collections of *F. bryoides* as well as that from the Rishiri, I found some differences between two species.

2. Some interesting mosses collected on Mt. Yatsu.

In last spring, on my way to the summit of Mt. Yatsu, I had a time to collect in the coniferous forest, about 2000-2100 m above sea level, near the Akadake mineral spring, where I found some attractive mosses on humus and andesite, which are as follows:

1) The Hattori Botanical Laboratory, Nichinan-shi (Obi), Miyazaki Prefecture.

2) This is closely related to and may possibly be conspecific with holarctic *F. incurvus* Starke=*F. bryoides* var. *incurvus* (Starke) Mönkem.



Text-fig. I

Fissidens minutulus Sull. (1~5) 1. Plant with sporophyte, $\times 18$. 2. Upper leaf, $\times 30$. 3. Lower leaf, $\times 30$. 4. Apex of upper leaf, $\times 350$. 5. Part of dorsal lamina, $\times 350$.

Fissidens bryoides Hedw. (6~11) 6. Plant with sporophyte, $\times 18$. 7. Median Stem leaf $\times 30$. 8. Leaf apex, $\times 350$. 9. Part of dorsal lamina, $\times 350$. 10. Capsule, $\times 10$. 11. Ditto (when dry), $\times 30$. 12. Capsule of *Fissidens tosaensis* Broth., $\times 30$.

Bartramia decuduaefolia Broth. et Yasuda (13~15) 13. Capsule, $\times 10$. 14. Peristome teeth, $\times 130$. 15. Spores, $\times 130$.

Bartramia halleriana Hedw. in Stirp. Crypt. 2:3, pl. 40 (1789).—*B. norvesica* (Gunn.) Lindb. in Öfv. Vet.—Akad. Förh. 20:389 (1863).

Hab. In crevices of a cliff in the coniferous forest, Mt. Yatsu, ca. 2100 m alt., Nagano Pref. (coll. Z. Iwatsuki no. 3299, 3300, May 5, 1954).

Range: Europe, Caucasus, North America, Africa, China, Japan, Formosa.

The present species is distinguishable by its tall and robust stem, and very short seta. It is one of the most magnificent species of the genus. Mt. Yatsu is the second station of the present species in Japan, since it has only been recorded from Mt. Neko, Nagano Prefecture (N. Takaki in Journ. Jap. Bot. 19:174, 1943).

Mnium spinosum (Voit.) Schwaegr. in Suppl. 1, 130 (1816).

Hab. On humus under the coniferous forest, on a slope, Mt. Yatsu, ca. 2100 m alt. above sea level (coll. Z. Iwatsuki nos. 26119, 26122, May 5, 1954).

Range: Europe, Caucasus, Central Asia, North America, Japan.

The present species grows in a fairly large tuft. Mt. Yatsu is the second station for the present species in Japan. Hitherto it has only been known from Mt. Senjō, South Japanese Alps (N. Takaki in Bot. Mag. Tokyo 67:793, 1945).

3. The sporophyte of *Bartramia deciduaefolia* Broth. et Yasuda.

The present species was described by Brotherus and Yasuda (Bot. Mag. Tokyo 29:23, pl. 3, 1915) based on Tsunoda's collection from Mt. Akagi. In 1951, N. Takaki (Journ. Jap. Bot. 26:177, 1951) added another locality, Mt. Fuji. In these years I have collected this species on Mts. Yatsu, Kitadake and Daisetsu. However, those collections all lack sporophyte. Recently, in the material collected on the Chichibu Mts. by D. Shimizu, I have detected some well developed capsules.

Synous; seta lateral, about 10–15 mm in length, erect, yellowish-brown, smooth. Capsule slightly inclined, oval-globose to subglobose, somewhat asymmetrical, 1.4–1.8 mm long, 1.3–1.5 mm wide, slightly striated when dry and empty, blackish-brown. Operculum conic and shortly rostrated, reddish-brown. Mouth 0.5 mm in diameter. Peristome teeth single, lanceolate, often irregular, 220–280 μ in length, yellowish-brown, fragile, sometimes 2-cleft near the base, 13–17 articulated, and densely and minutely papillose. Spores brown, almost reniform, warty, 27–32 μ in diameter.

Hab. On rocks, ca. 2200 m alt., Mt. Ōyama, Chichibu Mts., Saitama Pref. (coll. D. Shimizu no. 23291—with sporophyte).—On soil under the rocks, 1900 m alt., Mt. Daisetsu, Hokkaidō (coll. Z. Iwatsuki nos. 3264, 3269).—On soil, ca. 2100 m alt., Mt. Yatsu, Nagano Pref. (coll. Z. Iwatsuki no. 27804).—On soil, ca. 3000 m and ca. 2000 m alt., Mt. Kitadake, Nagano Pref. (coll. Z. Iwatsuki nos. 1032, 1086).

Range: Japan (Honshu; New to Hokkaidō!).

In sect. *Vaginella*, there are two species in Japan, *B. ithyphylla* and the present species. The peristome teeth of *B. ithyphylla* are double, and its capsules are more inclined and striate than those of the present species.

I take this opportunity to express my thanks to Dr. A. Noguchi, Professor of Kumamoto University, and Mr. N. Takaki, Assistant Professor of Nagoya University, for their helpful suggestions and criticisms. Particular thanks are due to Dr. S. Hattori, Director of our laboratory, for his constant advice and encouragement.

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* All communications should be addressed to:

Dr. Sinske HATTORI, Editor, (Obi) Nichinan, Miyazaki Prefecture, Japan.