

# BRYOPHYTE FLORA OF SUGADAIRA, CENTRAL JAPAN<sup>※</sup>

Kamezo SAITO

齊藤 亀三: 菅平のコケ植物

## Introduction

Bryophyte flora of Sugadaira was studied by Takaki (1943 a, b) and Iinuma (1968). Takaki reported 15 species of mosses (which include 5 new species), and Iinuma reported 45 species of mosses and 4 species of liverworts, including some uncertain species. In 1968—69, I had collected about 1500 packets of mosses and about 350 packets of liverworts and 2 packets of hornworts from various parts of Sugadaira.

I am deeply indebted to Prof. H. Ito and Dr. Nagano for their valuable advices, and for the identification or verification of some difficult species complex, I am indebted to Dr. Inoue, Dr. Noguchi, Dr. Hattori, Dr. Iwatsuki, Dr. Takaki, Dr. Ochi, Dr. Midzushima, Dr. Amakawa, Mr. Watanabe, and Mr. Matsuda. My sincere thanks are also due to Mr. I. Hayashi and Mr. Nagai for their kind assistances during my field work.

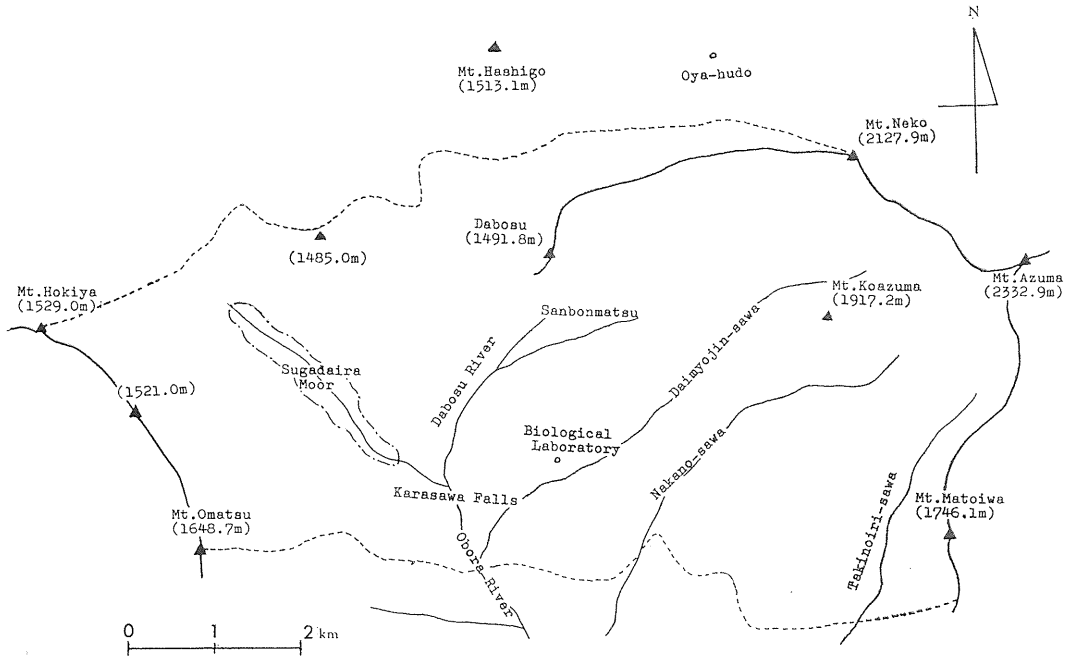


Fig. 1 Map of Sugadaira, ..... showing the border of the area where bryophytes were collected.

※ Contributions from the Sugadaira Biological Laboratory of Tokyo Kyoiku University No. 16.

### Outline of the area

#### A) Geographical and geological feature

Sugadaira situates in Sanada-machi, Chiisagata-gun, Nagano Prefecture, in central Japan, and this area is known as one of the most typical heights of volcanic origin in Japan. Sugadaira Biological Laboratory of Tokyo Kyoiku University, which locates at the nearly middle point in Sugadaira, is at  $138.^\circ 22' E.$  and  $36.^\circ 31' N.$  Northern parts of Sugadaira is bounded by Mt. Neko (2213m.) and Mt. Azuma (2332.9m) which have a vast slope extending to Sugadaira Heights. Sugadaira Moor was formed by the larval stream of Mt. Neko and Mt. Azuma. West part is bounded by Mt. Ōmatsu (1648.7 m) and Mt. Hokiya (1529.2 m). In the Sugadaira Heights, there are many valleys or rivers, among which the Ōbora River is the biggest one. The area is about  $12 \times 5 \text{ km}^2.$ , and the lowest point is 1200m. alt. and the highest 2330 m. alt. Geologically, Sugadaira is based on andesite of probably tertiary origin, and the most parts of the area are covered with volcanic ashes. Around the summit of Mt. Neko and Mt. Azuma, andesite rocks are exposed. The year mean temperature is  $6.2^\circ \text{C}.$  and the annual mean precipitation is 1076 mm. There is thick snow fall from November to April, and the average snowfall is measured 125 cm.

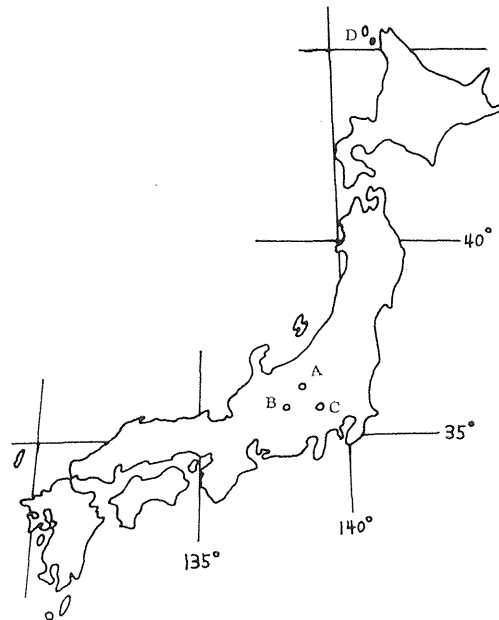


Fig. 2 Map showing the location of Sugadaira and other areas compared.  
 A. Sugadaira, B. Mt. Ontake, C. Chichibu Mts., D. Rebun & Rishiri  
 Isls.

## B) Floristic feature

The south slope of Mt. Neko and Mt. Azuma is the grazing land. The natural forest vegetation was almost destroyed for the farming, and most parts of this area is covered now with various types of grass communities. However, some *Fagus crenata-Quercus mongolica* var. *grosseserrata* forest are remained along the valleys or rivers, and some birch trees are scattered in the grass land. The well developed *Abies veitchii* forest are found between 1700—2200 m. of Mt. Azuma, and *Pinus pumilla* scrubs are developed around its summit area. On Mt. Neko, *Abies veitchii* develop around the summit area, and beech forest well develop above Ōya-hudo, between 1500—1700 m. Around the summit area of Mt. Ōmatsu poor beech forest is found, and *Larix leptolepis* trees are cultivated on the north slope of Mt. Ōmatsu. Main parts of Sugadaira Heights is farmal area with broad-leaved forests, *Pinus densiflora* forests, and *Larix leptolepis* forests. The broad-leaved forests are especially well developed around small streams, and main component of the forest is *Alnus japonica*. In the forest, the humidity and temperature are relatively higher than the open places in winter. The vegetation of Sugadaira Moor is mainly composed of *Carex* spp. and *Alnus japonica*. Partially they are continued to broad-leaved forests of the foot of Mt. Ōmatsu and Mt. Hokiya.

## Enumeration of Species

1) The present report is largely based on the collections made by the author and some duplicate specimens reported by Takaki (1943 a, b) and Iinuma (1968).

2) The arrangements of families and genera follow mainly that of A. Noguchi, 1957 : A preliminary list of Mosses of Japan and its Adjacent Areas., and M. Mizutani & S. Hattori, 1969 : Check list of Japanese Hepaticae and Anthocerotae. Species are alphabetically arranged.

3) Each species name is followed by the habitat, the number of the packets examined (in parenthesis) and the localities (abbreviation : Az. =Mt. Azuma, Db. = Dabosu, Dm. =Daimyojin-sawa, Kf. =Karasawa Falls, Nk. =Mt. Neko, Om. =Mt. Ōmatsu, Smo. =Sugadaira Moor, Tk. =Takinoiri-sawa) and note as occasion demands. Previous reports of the species are indicated.

4) The collections are located in the herbarium of K. Saito, in that of Tokyo National Science Museum and in that of Sugadaira Biological Laboratory of Tokyo Kyoiku University.

## I. HEPATICAE

Fam. **Herbertaceae**

1. *Heberta adunca* (Dicks.) Gray, On wet rock (3), Dm, Kf.

Fam. **Blepharostomataceae**

2. *Blepharostoma trichophyllum* (L.)

Dum., On humus (5) and decayed wood (1), Dm, Nk, Sm.

Fam. **Ptilidiaceae**

3. *Ptilidium pulcherrimum* (Web.)

Hampe, On bark (13) and rock (1), Dm, Nk, Az, Om. Previously reported by Ii-

numa (1968) as *Ptilidium* sp.

Fam. **Trichocoleaceae**

4. *Trichocolea tomentella* (Ehrh.)  
Dum., On rock (1), Sh.

Fam. **Lepidoziaceae**

5. *Bazzania ambigua* (Lindb.) Trev.  
subsp. *ovifolia* (Steph.) Hatt., On bark  
(2), rock (1) and decayed wood (1), Dm,  
Nk, Az.

6. *B. bidentula* (Steph.) Steph., On  
decayed wood (1), Nk.

7. *Kurzia makinoana* (Steph.) Gro-  
lle, On decayed wood (3), Dm.

8. *Lepidozia reptans* (L.) Dum., On  
decayed wood (2), Nk, Sh.

Fam. **Calypogeiaceae**

9. *Calypogeia arguta* Mont. et Nees,  
On soil (1), Sh.

10. *C. neesiana* (Mass. et Card.) K.  
Müll., On rock (1), decayed wood (3),  
humus (7) and soil (2), Dm, Nk, Az,  
Om, Sh.

11. *Metacalypogeia alternifolia* (Nees)  
Grolle, On decayed wood (1), Az.

12. *M. cordifolia* (Steph.) Inoue,  
On rock (1), decayed wood (1) and soil  
(1), Dm.

Fam. **Lophoziaceae**

13. *Anastophyllum assimile* (Mitt.)  
Steph., On bark (1) and wet soil (1),  
Nk.

14. *A. michauxii* (Web.) Buch, On  
bark (1), Nk.

15. *Chandonanthus pusillus* Steph.,  
On wet rock (3), Nk.

16. *Lophozia alpestris* (Schleich.)  
Evans, On humus (1) and soil (1), Nk.

17. *L. fauriana* Steph., On decayed  
wood (2), bark (1) and humus (3), Nk,  
Az.

18. *L. incisa* (Schrad.) Dum., On  
decayed wood (3), Dm.

19. *Barbilophozia attenuata* (Lindb.)  
Loeske, On decayed wood (1), Nk.

Fam. **Jungermanniaceae**

20. *Jungermannia amakawana* Grolle,  
On bark (1), wet rock (1), decayed wood  
(9) and humus (1), Dm, Nk, Az.

21. *J. exertifolia* Steph., On sub-  
merged rock(3), Dm. The specimens are  
very similar to *J. towadaensis* (Okam.)  
Hatt., but lamina cells are slightly ver-  
rucose. Cell surface of *J. towadaensis* is  
perfectly smooth, so that *J. towadaensis*  
may be a aquatic type of *J. exertifolia*.

22. *J. grossitexta* Steph., On wet  
rock (1), Nk.

23. *J. hattoriana* (Amak.) Amak.,  
On wet rock (3) and decayed wood (1),  
Dm.

24 a. *J. infusca* (Mitt.) Steph. var.  
*ovicalyx* (Steph.) Amak., On humus  
(1), Nk.

24 b. . . . . var. *ovalifolia* (Amak.)  
Amak., On wet rock (1), Dm.

25. *J. pyliflora* Steph., On rock (1)  
and humus (1), Dm, Nk.

26. *J. therumarum* Steph., On sub-  
merged rock (6), Dm. The relations of  
present species and sulfur springs are dis-  
cussed by many people. In Sugadaira, *J.*  
*therumarum* is living on submerged rock  
in Daimyojin-sawa which flows from Ōsu-  
kima and it is very rich in sulfur, so that  
Daimyojin-sawa indicates pH. 3.5—5.

27. *Mylia taylorii* (Hook.) Gray, On  
decayed wood (2), rock (1) and humus  
(2), Dm, Nk.

28. *M. verrucosa* Lindb., On humus  
(1), Sh.

29. *Nardia japonica* Steph., On soil (1), Az.

30. *N. sieboldii* (Sande Lac.) Steph., On soil (13), Dm, Nk, Sh.

31. *N. subclavata* (Steph.) Amak., On decayed wood (1) and submerged rock (1), Dm.

Fam. **Marsupellaceae**

32. *Gymnomitrium concinnatum* (Lightf.) Corda, On rock (1), Az.

33. *G. corallioides* Nees, On rock (1), Az.

34. *Marsupella emarginata* (Ehrh.) Dum. subsp. *tubulosa* (Steph.) Kit., On rock (2), Nk, Az.

35. *M. sphacelata* (Gies.) Dum., On wet rock (1), Dm.

Fam. **Scapaniaceae**

36. *Diplophyllum andrewsii* Evans, On humus (1), Az.

37. *D. albicans* (L.) Dum., On wet rock (2), soil (1) and humus (1), Dm, Az, Nk, Sh.

38. *D. obtusifolium* (Hook.) Dum., On soil (5), Sh, Sm.

39. *D. taxifolium* (Wahl.) Dum., On decayed wood (6), rock (10), humus (2) and soil (1), Dm, Nk, Az, Db.

40. *Macrodiplrophyllum plicatum* (Lindb.) Perss., On humus (2), Nk.

41. *Scapania bolancleri* Aust., Previously reported by Inuma (1968).

42. *S. parvidens* Steph., On wet rock (3), Dm.

43. *S. parvitexta* Steph., On rock (1), Nk.

44. *S. stephanii* K. Müll. On wet rock (1), Dm.

45. *S. undulata* (L.) Dum., On submerged rock (8), Dm.

Fam. **Lophocoleaceae**

46. *Chiloscyphus polyanthus* (L.) Corda, On submerged rock (6), Dm, Sm, Om, Kf, Tk.

47. *Lophocolea heterophylla* (Schrad.) Dum., On humus (2), bark (2) and decayed wood (4), Nk, Az, Sh.

48. *L. itoana* Inoue, On decayed wood (1) and wet humus (1), Dm.

48. *L. minor* Nees, On wet rock (2), decayed wood (3) and bark(1), Dm, Nk, Sh, Tk.

Fam. **Plagiochilaceae**

50. *Plagiochila firma* Mitt. subsp. *rhizophora* (Hatt.) Inoue, On wet rock (1), Dm.

51. *P. hakkodensis* Steph., On wet rock (6) and humus (4), Dm, Nk, Kf, Tk, Sh.

52. *P. ovalifolia* Mitt., On wet rock (4), Dm, Sh, Tk.

53. *P. satoi* Hatt., On rock(1), Dm.

54. *Xenochila integrifolia* (Mitt.) Inoue, On wet humus (2), Sh. The present species is rare in Japan, only known from four localities, and taxonomically very questionable.

Fam. **Antheliaceae**

55. *Anthelia juratzkana* (Limpr.) Trev., On bark (1), Nk.

Fam. **Cephaloziaceae**

56. *Cephalozia leuchantha* Spruce, On decayed wood (2), Sh.

57. *C. media* Lindb., On rock (2) and decayed wood (3), Nk, Om.

58. *C. otaruensis* Steph., On decayed wood (3) and wet soil (3), Dm, Sh.

59. *Schiffneria hyalina* Steph., On humus (1), Sh.

Fam. **Radulaceae**

60. *Radula auriculata* Steph., On rock (1), Nk.

61. *R. boryana* (Web.) Nees, On rock (1), Sh. ke, On soil (1), Dm.
62. *R. constricta* Steph., On trunk base (1), Om. 78. *Pellia endiviaefolia* (Dicks.) Dum., On wet soil (3), Dm.
63. *R. japonica* Gott., On rock (1), Dm. 79. *P. neesiana* (Gott.) Limpr., On wet soil (2), Tk.
64. *R. tokiensis* Steph., On rock (3), decayed wood (1) and trunk base (1), Dm, Sh, Smo, Tk.
- Fam. **Aneuraceae**
65. *Porella fauriei* (Steph.) Hatt. On rock (3), Dm, Nk. 80. *Aneura pellioides* (Horik.) Inoue, On wet rock (1), Dm. In Japan, the present species is rather rare and two localities, Mt. Ontake and Chichibu Mts., are known.
66. *P. grandiloba* Lindb., On rock (5), Dm, Sh, Tk.
- Fam. **Metzgeriaceae**
- Fam. **Frullaniaceae**
67. *Frullania fauriana* Steph., On bark (4), Smo. 81. *Riccardia multifida* Gray, On wet rock (1), Dm.
68. *F. hamatiloba* Steph., On rock (6), Dm.
- Fam. **Metzgeriaceae**
69. *F. jackii* Gott. subsp. *japonica* (Sande Lac.) Hatt., On bark (1), Dm. 82. *Metzgeria conjugata* Lindb. subsp. *japonica* (Hatt) Kuwah., On rock (2), decayed wood (1) and bark (1), Dm, Nk, Om.
- 70 a. *F. muscicola* Steph. var. *muscicola*, On bark (11), Dm, Sh, Smo.
- 70 b. .... var. *inuea* (Steph.) Kamim., On bark (2), Smo.
- Fam. **Conocephalaceae**
71. *F. schensiana* Mass., On bark (3), Smo. 83. *Conocephalum conicum* (L.) Dum., On wet rock (5) and humus (2), Dm, Om, Kf, Tk.
72. *F. takayuensis* Steph., On bark (3), Dm, Nk, Db. 84. *C. supradecompositum* (Lindb.) Steph., On wet soil (1), Smo.
73. *F. tamariscinum* (L.) Dum., On rock (1), Dm.
- Fam. **Marchantiaceae**
- Fam. **Jubulaceae**
74. *Nipponolejeunea pilifera* (Steph.) Hatt., On rock (1), Tk. 85. *Marchantia polymorpha* L., The present species is very common in Japan, but I could not find in Sugadaira. It was only reported by Iinuma (1968).
75. *N. subalpina* (Horik.) Hatt., On bark (2), Nk, Az.
- II. **ANTHOCEROTACEAE**
- Fam. **Anthocerotaceae**
76. *Lejeunea japonica* Mitt., On wet rock (2), Dm. 1. *Anthoceros punctatus* L., On wet rock (2), Dm.
- III. **MUSCI**
- Fam. **Sphagnaceae**
- Fam. **Dilaenaceae**
77. *Makinoa crispata* (Steph.) Miya-
2. *S. girgensohnii* Russ., On wet soil

(5), Nk, Az.

3. *S. squarrosum* Samml., On wet rock (1) and wet soil (2), Dm, Om, Sh.

Fam. **Andreaeaceae**

4. *Andreaea rupestris* Hedw. var. *fauriei* (Besch.) Tak., On rock (9), Nk, Az. Previously reported by Iinuma (1968).

Fam. **Tetraphidaceae**

5. *Tetraphis pellucida* Hedw., On decayed wood (2) and humus (2), Dm, Nk, Az.

Fam. **Buxbaumiaceae**

6. *Buxbaumia aphylla* Hedw., On decayed wood (2) and trunk base (2), Dm, Nk, Az.

Fam. **Diphysciaceae**

7. *Diphyscium foliosum* (Hedw.) Mohr., On rock (1) and soil (2), Dm, Nk.

8. *D. fulvifolium* Mitt., On soil (2), Dm.

Fam. **Polytrichaceae**

9 a. *Atrichum undulatum* (Hedw.) P. Beauv. var. *undulatum*, On soil (6), Nk, Om, Sm, Sh.

9 b. . . . . var. *haussknechtii* (Jur. et Milde) Frye, On soil (8), Dm, Db, Om, Sh.

9 c. . . . . var. *minus* (Lam. et DC.) Web. et Mohr., On soil (11), Dm, Nk, Db, Om, Sh.

10. *Oligotrichum parallelum* (Mitt.) Kindb., On soil (5), Nk, Az, Db, Sh.

11. *Bartramiopsis lescurii* (James.) Kindb., On soil (5), Az.

12. *Pogonatum akitense* Besch., On soil (4), Db, Om, Sh.

13. *P. alpinum* (Hedw.) Roehl., On sandy soil (4) and soil (2), Nk, Az.

14. *P. contortum* (Schwaegr.) Sull.,

On soil (5), Az, Db.

15. *P. inflexum* (Lindb.) Par., On soil (7), Dm, Nk, Db, Tk, Sh. Previously reported by Iinuma (1968).

16. *P. japonicum* Sull. et Lesq., On humus (1), Nk. Previously reported by Iinuma (1968).

17. *P. spinulosum* Mitt., On soil (1), Dm.

18. *P. urnigerum* (Hedw.) Palis., On sandy soil (4), Dm, Sm.

19 a. *Polytrichum commune* Hedw. var. *commune*, On sandy soil (1), Dm, Az, Sh. Previously reported by Iinuma (1968).

19 b. . . . . var. *maximowiczii* Lindb., On soil (1), Nk. Previously reported by Iinuma (1968).

19 c. . . . . var. *swartzii* (Hartm.) Moenk., On soil (1), Nk.

20. *P. formosum* Hedw. var. *inter-sedens* (Card.) Osada, On soil (2), Nk, Az.

21. *P. piliferum* Hedw., On rock (7) and soil (2), Nk, Az, Db, Om.

Fam. **Fissidentaceae**

22. *Fissidens cristatus* Wils., In rock crevice (3) and on soil (2), Dm, Nk, Az, Sh. Previously reported by Iinuma (1968).

23. *F. gymnogynus* Besch., On soil (5), Dm, Sh.

24. *F. minutulus* Sull., On rock (1), Om.

25. *F. osmundioides* Hedw., On wet rock (1), Dm.

Fam. **Ditrichaceae**

26. *Ditrichum divaricatum* Mitt., In rock crevice (1), Om.

27. *D. heteromallum* (Hedw.) E. G. Britton, On sandy soil (1), Dm.

28. *D. pallidum* (Hedw.) Hampe, On soil (1), Om.

29. *Saelania glaucescens* (Hedw.) Broth., On soil (4) and sandy soil (3), Dm, Nk, Sh.
30. *Ceratodon purpureus* (Hedw.) Brid., On rock (9), soil (3) and straw-thatched roof (2); Dm, Nk, Az, Db, Sh.
- Fam. **Bryoxiphiaceae**
31. *Bryoxiphium norvegicum* Mitt. subsp. *japonicum* (Bergr.) Löve et Löve, On rock (3), Dm.
- Fam. **Dicranaceae**
32. *Trematodon longicollis* Michx., Previously reported by Iinuma (1968).
33. *Dicranella heteromalla* (Hedw.) Schimp., On sandy soil (8) and soil (11), Dm, Nk, Db, Om, Sh.
34. *D. subulata* (Hedw.) Schimp., On sandy soil (1), Dm. The present species widely distributes in Europe, North America and Asia, but very rare in Japan Sakurai(1934) once reported as *D. secunda* Lindb. from Mt. Myoko. The diagnostic characters of the species are the red seta and narrow costa (about 1/5 at leaf base).
35. *Dicranodontium denudatum* (Brid.) E. G. Britton, On rock (2) and humus (1), Dm, Nk.
36. *Rhabdoweisia denticulata* (Brid.) B. S. G., On soil (12), Dm, Nk, Az, Db.
- 37 a. *Cynodontium polycarpum* (Hedw.) Schimp. var. *polycarpum*, On sandy soil (1) and wet soil (1), Dm, Nk.
- 37 b. . . . . var. *strumiferum* (Hedw.) Schimp., On humus (1), Nk.
38. *Dichodontium pellucidum* (Hedw.) Schimp., On wet soil(1), Sh. The present species usually occur in calcareous substrate, but Sugadaira Heights is covered with acidic soil.
39. *Onchophorus crispifolius* (Mitt.) Lindb., On decayed wood (1), Nk.
40. *O. wahlenbergii* Brid., On humus (1), Nk.
41. *Arctoa fulvella* (Dicks.) B. S. G., On rock (1), Az. The present species was previously reported by Takaki (1943 a) as *A. andrewsonii* Wichura.
42. *Dicranum flagellare* Hedw., On bark (2) and decayed wood (2), Nk, Om, Sh.
43. *D. fragilifolium* Lindb., On trunk base (1), Az.
44. *D. fulvum* Hook., On decayed wood (1), Sh.
45. *D. fuscescens* Turn., On bark (5) and humus (3), Nk, Az.
46. *D. hamulosum* Mitt., On bark (3) and humus (2), Nk, Az. Previously reported by Iinuma (1968).
47. *D. japonicum* Mitt., On humus (8), Dm, Az, Sh, Om.
48. *D. leiodontum* Card., On decayed wood (2), Nk, Az.
49. *D. majus* Turn., On humus (6), Nk, Az. Previously reported by Iinuma (1968).
50. *D. mayrii* Broth., On decayed wood (2) and bark (1), Sh, Om.
51. *D. nipponense* Besch., On rock (3), humus (8) and decayed wood (2), Dm, Nk, Az, Sh, Sm, Om.
52. *D. polysetum* Sw., On humus (7), Dm, Nk, Az, Sh. The present species was previously reported by Takaki (1943 a) as *D. undulatum* Sak., and Iinuma (1968).
53. *D. setifolium* Card., On rock (5), Nk, Az.
54. *D. viride* (Sull. et Lesq.) Lindb., On bark (6), Dm, Nk, Az, On. Previ-



ously reported by Iinuma (1968).

55. *Dicranoloma cylindrothecium* (Mitt.) Sak., On bark (1) and decayed wood (1), Dm, Az.

Fam. **Leucobryaceae**

56. *Leucobryum neilgherrense* C. Müll., On rock (1) and humus (1), Dm.

Fam. **Pottiaceae**

57. *Weisia controversa* Hedw., On rock (2) and soil (1), Sm, Sh.

58. *W. platyphylla* Broth., On soil (1), Dm.

59. *Gymnostomum aeruginosum* Sm., On rock (1), Dm. The present species was previously reported by Takaki (1943 b) as *G. rupestre* Schleich.

60. *Trichostomum cylindricum* (Bruch) C. Müll., On rock (3), Dm.

Fam. **Grimmiaceae**

61. *Coscinodon cribrosus* (Hedw.) Spruce, On rock (2), Nk, Az.

62. *Grimmia alpestre* Schleich., On rock (11), Dm, Nk, Az, Tk.

63. *G. apocarpa* Hedw., On rock (8), Dm, Nk, Sh, Tk. Previously reported by Iinuma (1968).

64. *G. decalvata* Card. Previously reported by Takaki (1943 b) as *Coscinodon japonicus* Sak. Later Takaki (1951) revised it as a synonym of *G. decalyata* Card.

65. *G. doniana* Sm., On rock (10), Nk, Az.

66. *G. hartmanii* Schimp., On wet rock (2), Dm.

67. *G. montana* B. S. G. On rock (1), Az.

68. *G. olympica* E. G. Britton, In rock crevice (1), Az. The present species was only known from North America until now. The plant is very small, up to 1

mm. high, and growing in rock crevice of Mt. Koazuma. Up to this time, the species was indistinct that the plant was monoecious or dioecious. However, the specimens from Sugadaira proved that the plant is distinctly monoecious (Noguchi & Saito 1970).

69. *G. ovalis* (Hedw.) Lindb., On rock (1), Az.

70 a. *Rhacomitrium canescens* (Hedw.) Brid. var. *canescens*, On sandy soil (1) and soil (1), Dm, Om.

70 b. . . . . var. *ericoides* (Web.) Schimp., On sandy soil (5) and rock (10), Dm, Nk, Az, Sh, Om. Previously reported by Iinuma (1968).

71. *R. carinata* Card., On rock (1), Sh. Previously reported by Iinuma (1968).

72. *R. fasciculare* (Hedw.) Brid., On rock (9), Dm, Nk, Az.

73. *R. fauriei* Card., On rock (4), Dm, Az.

74. *R. heterostichum* (Hedw.) Brid., On rock (14), Dm, Nk, Az.

75. *R. lanuginosum* (Hedw.) Brid., On rock (4), Nk, Az. Previously reported by Iinuma (1968).

Fam. **Erpodiaceae**

76. *Glyphomitrium humillimum* (Mitt.) Card., On rock (5), Dm, Sh.

Fam. **Funariaceae**

77. *Physcomitrium sphaericum* (Schleich.) Brid., On soil (2), Dm, Om.

78. *Funaria hygrometrica* Hedw., On stone wall (1), Dm.

Fam. **Oedipodiaceae**

79. *Oedipodium griffithianum* (Dicks.) Schwaegr., In rock crevice (1) and on wet rock (1), Az, Dm. The present species usually grows in rock crevice of sub-alpine region, but in Daimyojin-sawa it

occurs on wet cliff of river side, ca. 1200 m. alt. The habitat of Daimyojin-sawa is very strange, and it may be the lowest locality in Japan.

Fam. **Splachnaceae**

80. *Tetraplodon angustus* Schwaegr., The present species was previously reported by Takaki (1943 a) as *Voitia nivalis* Hornsch. Later Iwatsuki personally revised it as *T. angustus* Schwaegr.

Fam. **Schistostegaceae**

81. *Schistostega osmundacea* (Hedw.) Hook. et Tayl., On soil in rock crevice (2) and soil in root gap (1), Nk, Az. Previously reported by Iinuma (1968). The cave near Daimyojin Falls was appointed as a natural monument, but now the plant almost exterminated.

Fam. **Bryaceae**

82. *Mielichhoferia mielichhoferiana* (Hook.) Wijk. et Marg. var. *japonica* (Besch.) Wijk. et Marg., In rock crevice (1), Dm.

83. *Pohlia camptotrachella* (Ren. et Card.) Broth., On rock (3), Dm, Nk.

84. *P. cruda* (Hedw.) Lindb., In rock crevice (1) and on rock (1), Dm, Nk.

85. *P. elongata* Hedw., On decayed wood (1), Sh. Previously reported by Iinuma (1968).

86. *P. flexuosa* Hook., On soil (1), Db.

87. *P. lescuriana* (Sull.) Ochi, On humus (1), Nk.

88. *P. nutans* (Hedw.) Lindb., On humus (11), Nk, Az, Sh, Om.

89. *P. prolifera* (limpr.) Lindb., On soil (2), Dm, Sm.

90. *P. wahlenbergii* (Web. et Mohr.) Andrews., On wet rock (1), Dm.

91. *Brachymenium nepalense* Hook. var. *clavulum* (Mitt.) Ochi, On bark (5), Dm, Sm, Om, Smo.

92. *Bryum argenteum* Hedw., On stone wall (4) and rock (3), Dm, Az, Kf.

93. *B. atrovirens* Will. ex Brid., On wet soil (1), Om.

94. *B. caespiticium* Hedw., On stone wall (1) and soil (6), Dm, Nk, Az, Sh, Db. Previously reported by Takaki (1943 b).

95. *B. capillare* Hedw., On rock (4), decayed wood (2) and soil (4), Dm, Om, Kf.

96. *B. cyclophyllum* (Schwaegr.) B. S. G., On submerged rock (2), Dm. Previously reported by Takaki (1943 b) as *B. takakii* Sak. which was later emended by Ochi (1959).

97. *B. giganteum* (Schwaegr.) Arnott., On wet soil (1), Sh.

98. *B. pallescens* (Schleich.) Lindb., On soil (1), Dm. Previously reported by Iinuma (1968).

99. *B. pseudo-triquetrum* (Hedw.) Schwaegr., On wet rock (8), Dm, Om, Kf.

100. *B. roseum* (Hedw.) Crum, On humus (3), Om, Kf

101. *B. turbinatum* (Hedw.) Turn., On humus (2), Dm.

102. *B. weigelii* Spreng., On wet soil (1), Smo.

Fam. **Mniaceae**

103 a. *Mnium cuspidatum* Hedw. var. *cuspidatum*, On humus (1), Om. Previously reported by Iinuma (1968).

103 b. . . . . var. *trichomanes* (Mitt.) Jaeg., On decayed wood (1), humus (5) trunk base (5) and soil (2), Nk, Sh, Om.

104. *M. flagellare* Sull. et Lesq., On decayed wood (3), humus (2) and trunk base (1), Dm, Nk, Om, Sh.

105. *M. laevinerve* Card., On humus (5) and trunk base (1), Dm, Az, Nk, Smo. Previously reported by Iinuma (1968).

106. *M. longirostre* Brid., On wet rock (9), humus (1) and decayed wood (1), Dm, Nk, Om.

107. *M. medium* B. S. G., On wet humus (3), Sh, Om.

108. *M. punctatum* Hedw., On wet rock (2), wet humus (3) and decayed wood (2), Dm, Az, Nk.

109. *M. speciosum* Mitt., On humus (2), Nk.

110. *M. stellare* Hedw., On rock (6) and decayed wood (1), Sm, Om, Kf, Tk.

111. *M. striatulum* Mitt., On wet rock (2) and decayed wood (2), Dm, Az, Nk, Sh.

112 a. *M. vesicatum* Besch., var. *vesicatum*. On humus (1), Sh.

112 b. .... var. *kiyoshii* Noguchi, On wet rock (2), Dm.

Fam. **Aulacomniaceae**

113. *Aulacomnium heterostichum* (Hedw.) B. S. G., On humus (4), Dm. The present species was previously reported by Takaki (1943 a) as *Thamnium undulatifolium* Sak., later Takaki (1949) revised it as *Aulacomnium heterostichum* (Hedw.) B. S. G.

114. *A. palustre* (Hedw.) Schwaegr., On wet soil (3), Om.

Fam. **Bartramiaceae**

115. *Bartramia halleriana* Hedw., Previously reported by Takaki (1943 a) as *B. norvegica* (Gumn.) Lindb.

116. *B. ithyphylla* Brid., On decayed wood (1) and soil (2), Dm, Db, Sm.

117. *B. pomiformis* Hedw., On decayed wood (1) and humus (2), Dm, Sh. Previously reported by Iinuma (1968).

118. *Philonotis falcate* (Hook.) Mitt. var. *carinata* (Mitt.) Ochi, On wet rock (1), Kf.

119. *P. fontana* (Hedw.) Brid., On wet rock (6), Dm, Sm.

Fam. **Orthotrichaceae**

120 a. *Zygodon viridissimus* (Dicks.) Brid. var. *viridissimus*, On bark (3), Smo. The present species distributes in Europe, North America and Asia. In Japan, Iwatsuki (1965) reported from Chichibu Mts. The author studied those specimens and identified that they were *Z. viridissimus* var. *rupestris* (K. Saito, 1970). Although the plants from Sugadaira are very small they have many characteristic propagulae on leaf axil.

120 b. .... var. *rupestris* Malta, On bark (2), Smo. E. Nyholm distinguished *Z. vulgaris* (Malta) Nyholm from *Z. viridissimus* (Dicks.) Brid., but I think that *Z. vulgaris* is rather suitable as a variety of *Z. viridissimus* (Dicks.) Brid.

121. *Orthotrichum amabile* Toyama, On bark (5), Sh, Smo, Tk.

122. *O. consobrinum* Card., On bark (4), trunk base (3) and fallen log (1), Dm, Sh.

123. *O. sordidum* Lesq. et James., On bark (10), Dm, Sm, Smo.

124. *Ulota crispa* (Hedw.) Brid., On bark (20), Dm, Nk, Db, Sm, Om, Smo, Tk.

125. *U. drummondii* (Hook. et Grev.) Brid., On bark (6), Dm, Nk, Om, Sh.

126. *U. japonica* (Sull. et Lesq.)

Mitt., On bark (1), Om.

127. *U. reptans* Mitt., On bark (2), Om.

128. *Macromitrium ferriei* Card. et Thér., On bark (2), Smo.

129. *M. japonicum* Doz. et Molk., On bark (3), Sm, Smo.

Fam. **Fontinalaceae**

130. *Fontinalis antipyretica* Hedw., On submerged rock (3), Smo, Sh.

131. *F. hypnoides* R. Hartm., On submerged rock (1), Smo. Previously reported by Iinuma (1968).

Fam. **Climaciaceae**

132. *Climacium dendroides* (Hedw.) Web. et Mohr., On wet humus (11), Dm, Sh, Sm, Om, Kf.

133. *Pleuroziopsis ruthenica* (Weimn.) Kindb., On humus (6), Nk, Az. Previously reported by Iinuma (1968).

Fam. **Hedwigiaceae**

134. *Hedwigia ciliata* (Hedw.) P. Beauv., On rock (1), Kf.

Fam. **Cryphaeaceae**

135. *Forstroemia japonica* (Besch.) Par., On rock (4), Dm.

Fam. **Leucodontaceae**

136. *Leucodon coreensis* Card., On bark (2), Sm.

Fam. **Neckeraceae**

137. *Neckera yezoana* Besch., On bark (1), Om.

138. *Homalia japonica* Besch., On rock (5), Dm.

139. *H. trichomanoides* (Hedw.) B. S. G., On rock (4), Nk, Az.

140. *Thamnum alopecurum* (L.) B. S. G., On wet rock (1), Sm.

141. *T. plicatulum* Lac., On rock (5), Dm, Sm, Sh, Kf.

142. *T. sandei* Besch., On rock (8), Dm, Nk, Om, Tk.

Fam. **Lembophylliaceae**

143. *Dolichomitriopsis diversiformis* (Mitt.) Nog., On rock (1), Om.

Fam. **Theliaceae**

144. *Fauriella tenuis* (Mitt.) Card., On trunk base (2), bark (1) and decayed wood (2), Sm, Om, Sh.

Fam. **Fabroniaceae**

145. *Anacamptodon latidens* (Besch.) Broth., On bark (2), Nk.

146. *Schwetschkeopsis japonica* (Besch.) Broth., On rock (3), bark (1), and trunk base (1), Dm, Db.

Fam. **Leskeaceae**

147. *Leskea pusilla* Mitt., On bark(2) and decayed wood (1), Smo.

148. *Lescuraea saxicola* (B. S. G.) Milde., On decayed wood (4), Smo. Previously reported by Iinuma (1968).

149. *Lesquereuxia robusta* Lindb., On rock (2) and decayed wood (4), Nk, Az, Db.

150. *Okamuraea brevipes* Broth., On bark (2), Smo. Takaki (1943 a) reported *Okamuraea pilifera* Sak. from Sugadaira, later Noguchi (1953) revised it as a synonym of *O. brevipes* Broth.

151. *O. hakoniensis* (Mitt.) Broth., On bark (1), Smo.

Fam. **Thuidiaceae**

152. *Haplhymenium longinerve* (Broth.) Broth., On rock (1), Dm.

153. *H. pseudo-triste* (C. Müll.) Broth., On bark (7), Dm, Smo, Sh.

154. *Anomodon giraldii* C. Müll., On rock (6) and decayed wood (1), Dm, Nk, Sh, Kf.

155. *A. minor* (Hedw.) Fuernr. subsp.

*integerrimus* (Mitt.) Iwats., On rock (2) and trunk base (1), Dm, Sm.

156 a. *A. rugelii* (C. Mull.) Keissl. var *rugelii*, On rock (7), decayed wood (3), trunk base (1) and bark (1), Dm, Nk, Om, Sh, Smo. Previously reported by Iinuma (1968).

156 b. . . . . var. *ferrugineus* (Besch.) Iwats., On rock (1) and bark (4), Dm, Smo.

157. *Cladopodium nervosum* (Harv.) Fleisch., On decayed wood (2), trunk base (1), humus (1) and bark (1), Az, Sh.

158. *C. pellucinerve* (Mitt.) Best., On rock (5) and trunk base (1), Om, Kf, Tk.

159. *Haplocladium microphyllum* (Sw.) Broth., On decayed wood (5), rock (1), trunk base (2) and bark (2), Dm, Nk, Sh, Smo.

160. *H. strictulum* (Card.) Reimers, On bark (2), Smo.

161. *Boulaya mittenii* (Broth.) Card., On bark (6) and rock (1), Dm, Sm, Om, Smo.

162. *Rauiella fujisana* (Par.) Reimers, On rock (2), decayed wood (4) and bark (4), Dm, Om, Smo.

163. *Thuidium cymbifolium* (Dozy. et Molk.) Dozy. et Molk., On trunk base (1), Dm,

164. *T. kanedae* Sak., On humus (6), rock (3) and decayed wood (1), Dm, Sm, Sh, Om. Previously reported by Iinuma (1968).

165. *T. philiberti* Limpr., On rock (1), Dm.

166. *T. recognitum* (Hedw.) Lindb., On wet rock (3), decayed wood (1) and humus (10), Dm, Nk, Sh, Om, Tk. Previously reported by Iinuma (1968).

167. *T. tamariscinum* (Hedw.) B. S. G., On humus (1), Nk.

168. *Hylocomiopsis ovicarpa* (Besch.) Card., On decayed wood (4), Nk, Sm.

169. *Bryonoguchia molkenboeri* (Lac) Iwats. et Inoue. On rock (1), Dm.

170. *Helodium paludosum* (Sull.) Aust., Previously reported by Takaki (1943 b).

#### Fam. **Amblystegiaceae**

171. *Cratoneuron filicinum* (Hedw.) Broth., On wet rock (1) and wet humus (1), Dm, Tk.

172. *Campylium chrysophyllum* (Brid.) Brhyn, On rock (1), Sm.

173. *C. hispidulum* (Brid.) Mitt., On rock (1), Tk. Previously reported by Takaki (1943 b) as *Rhynchostegium bandaiensis* (Brid.) Mitt. Later Takaki (1956) revised it as *C. hispidulum* (Brid.) Mitt.

174. *Hygroamblystegium tenax* (Hedw.) Jenn., On submerged rock (1), Kf.

175. *Amblystegium kochii* B. S. G., On wet soil (1) and decayed wood (1), Smo, Sh. Previously reported by Takaki (1943 b) as *Heterocladium japonicum* Sak.

176. *A. serpens* (Hedw.) B. S. G., On trunk base (4), Db, Smo.

177. *Drepanocladus uncinatus* (Hedw.) Warnst., On bark (3) and humus (4), Nk, Az.

178. *Calliergonella schreberi* (B.S.G.) Grout, On humus (11), Nk, Az. Previously reported by Iinuma (1968).

#### Fam. **Brachytheciaceae**

179. *Camptothecium auriculatum* (Lindb.) Broth., On decayed wood (1), Nk.

180. *Homalothecium laevisetum* Lac., On bark (1), Dm.

181. *Brachythecium brotheri* Par., On decayed wood (2), trunk base (1) and humus (1), Dm, Sh, Om.
182. *B. buchananii* (Hook.) Jaeg., On decayed wood (1) and humus (4), Az, Db.
183. *B. calliergonoides* Broth., On humus (1), Sh.
184. *B. collinum* Schleich., On humus (1), Nk.
185. *B. coreanum* Card., On decayed wood (2), Om.
186. *B. glareosum* (Bruch) B. S. G., Previously reported by Iinuma (1968).
187. *B. kuroishichum* Besch., On rock (1) and decayed wood (5), Om, Sh, Smo.
188. *B. plumosum* (Sw.) B. S. G., On soil (2), humus (2), and rock (2), Dm, Db, Sm, Nk, Sh.
189. *B. populeum* (Hedw.) B. S. G., On soil (3), humus (2), decayed wood (1), bark (1) and rock (3), Nk, Db, Sh, Om. Previously reported by Iinuma (1968).
190. *B. reflexa* (Stark.) B. S. G., On decayed wood (1), bark (1) and trunk base (1), Dm, Sm, Smo.
192. *B. rivulare* B. S. G., On wet rock (5), wet soil (4) and humus (1), Dm, Om, Smo, Tk, Kf.
193. *B. rutabulum* (L.) B. S. G., On trunk base (1), Om, Sh. Previously reported by Iinuma (1968).
194. *B. salebrosum* (Hoff.) B. S. G., On humus (1), Dm, Om. Previously reported by Iinuma (1968).
195. *B. starkei* (Brid.) B. S. G., On humus (3) and decayed wood (1), Nk, Az, Om, Sh.
196. *B. uncinifolium* Broth. et Par., On rock (1), Kf.
197. *Brhynia brachyclada* Card., On wet soil (1), Sh. Previously reported by Iinuma (1968). In Japan, the present species are only known from Omachi and Sugadaira. The diagnostic characters of the species are broadly ovate stem leaves and short-rhomboidal upper leaf-cells.
198. *B. noesica* (Besch.) Broth., On wet soil (1), Smo.
199. *B. novae-angliae* (Sull. et Lesq.) Grout, On trunk base (1) and wet soil (1), Smo, Om. Previously reported by Iinuma (1968).
200. *B. tokubuchii* Broth., On wet rock (1), Dm.
201. *Cirriphyllum piliferum* (Hedw.) Grout, On stone wall (1), rock (1), soil (1), Dm, Sh, Smo, Tk.
202. *Myuroclada maximowiczii* (Borosz.) Steere, On soil (3), decayed wood (1) and trunk base (6), Dm, Om, Sh, Smo. Previously reported by Iinuma (1968).
203. *Rhynchostegium pallidifolium* (Mitt.) Jaeg., On soil (2), Dm, Db.
204. *Eurhynchium eustegium* (Besch.) Dix., On rock (2), humus (3) and decayed wood (1), Nk, Sm, Om, Sh.
205. *E. riparioides* (Hedw.) Jenn., On submerged rock (3), Dm, Om, Tk. Previously reported by Iinuma (1968).

Fam. **Entodontaceae**

206. *Entodon compressus* C. Müll., On bark (6), trunk base (4) and decayed wood (1), Dm, Smo.
207. *E. scabridens* Lindb., On bark (8) and decayed wood (1), Dm, Sm, Om, Smo.
208. *E. sullivantii* (C. Müll.) Lindb., On rock (2) and decayed wood (1), Dm,

Sh, Tk.

Fam. **Plagiotheciaceae**

209. *Plagiothecium curvifolium* Schle-  
ich, ex Limpr., On wet humus (2), Az,  
Om.

210. *P. denticulatum* (Hedw.) B. S.  
G. var. *undulatum* Ruthe, ex Geheeb,  
On soil (1), humus (2) and rock (1), Dm,  
Om, Sh.

211. *P. fallax* Card. et Thér., On rock  
(1), humus (2) and decayed wood (1),  
Dm, Nk, Sm.

212 a. *P. roseanum* B. S. G. var.  
*roseanum*, On soil (2), Dm.

212 b. . . . . var. *japonicum* Card., On  
soil (1) and decayed wood (1), Dm, Nk.

213. *P. splendens* Schimp. ex Card.,  
On decayed wood (1), Dm.

214. *P. sylvaticum* (Brid.) B. S. G.,  
On wet rock (1), trunk base (2) and  
humus (1), Dm, Smo.

215. *Isopterygiopsis mulleriana* (Sch-  
imp.) Iwats., Previously reported by Ta-  
kaki (1943 a) as *Isopterygium elegans*  
(Hook.) Lindb.

216. *Herzogiella turfacea* (Lindb.)  
Iwats., On humus (4), trunk base (2) and  
decayed wood (2), Nk, Om, Tk.

217. *Taxiphyllum aomoriense* (Besch.)  
Iwats., On wet rock (9), Kf, Tk.

Fam. **Hypnaceae**

218. *Clastobryella kusatsuensis* (Be-  
sch.) Iwats., On bark (3), trunk base  
(3), rock (1) and decayed wood (3), Dm,  
Db, Om, Sh, Smo.

219. *Platygyrium repens* (Brid.) B. S.  
G., On bark (8) and decayed wood (1),  
Dm, Db, Sm, Om, Smo.

220. *Pylaisia brotheri* Besch., On  
bark (3), Smo.

221. *P. subcircinata* Card., On bark  
(4), Om, Smo.

222. *Brotherella henoni* (Duby) Fl-  
eish., On bark (1), Nk.

223. *Heterophyllum nemorosum* (W.  
Koch ex Brid.) Kindb., On rock (3) and  
humus (1), Nk.

224. *Hypnum callichroum* (Brid.) C.  
Müll., On humus (1) and bark (2), Nk,  
Az, Om.

225. *H. crista-castrensis* Hedw., On  
humus (2), Nk.

226. *H. cupressifolium* Hedw., On  
trunk base (2) and decayed wood (2),  
Sm, Sh.

227. *H. dieckii* Ren. et Card., On wet  
rock (7), Dm.

228. *H. erectiusculum* Sull. et Lesq.,  
On wet soil (1), Smo. Previously report-  
ed by Iinuma (1968) as *H. homaliaceum*  
(Besch.) Dignon.

229. *H. fujiyamae* (Broth.) Par., On  
humus (1) and rock (1), Om, Sh.

230. *H. haldanianum* Grev., On rock  
(3), decayed wood (6), bark (1) and  
trunk base (2), Dm, Nk, Sh, Om. Pre-  
viously reported by Iinuma (1968) as *He-  
terophyllum haldanianum* (Grev.) Kindb.

231. *H. lindbergii* Mitt., On trunk  
base (1) and rock (4), Nk, Sm.

232. *H. oldhamii* (Mitt) Jaeg., On  
rock (2), Dm.

233. *H. plicatulum* (Lindb.) Jaeg.,  
On humus (5), bark (3), rock (1) and  
decayed wood (1), Nk, Az.

234. *H. plumaeforme* Wils., Previously  
reported by Iinuma (1968).

235. *H. reptile* Michx., On bark (5);  
Nk, Az.

236. *H. sakuraii* (Sak.) Ando var.

*venustum* Ando, On bark (1), Om.

237. *H. subimponens* Lesq., On bark (1), Az.

238. *Rhytidium rugosum* (Hedw.) Kindb., On humus (3), Nk, Az. Previously reported by Iinuma (1968).

239. *Rhytidiadelphus calvescens* (Wils.) Broth., On rock (3) and humus (5), Dm, Nk.

Fam. **Hylocomiaceae**

240. *Hylocomium cavifolium* Lac., On rock (1), Dm.

241. *H. pyrenaicum* (Spruce) Fleisch., On rock (3), decayed wood (2) and humus (1), Dm, Nk, Sm.

242. *H. splendens* Hedw., On wet rock (1) and humus (3), Dm, Nk, Az.

### Comparison of Bryophyte flora of Sugadaira

From previous literature and my collections, a total of 85 species of Hepaticae belonging to 39 genera and 22 families, 1 species of Anthocerotae belonging to 1 genus and 1 family, and 242 species of Musci belonging to 105 genera and 40 families are recorded from Sugadaira.

The phytogeographical elements of bryophyte flora of the present area is analyzed in comparison with those of Rishiri and Rebun Isls. (northern Japan), Chichibu Mts. (central Japan), and Mt. Ontake (central Japan).

#### I). Hepaticae

A. The species common to the present area and Rishiri & Rebun Isls. are 42, majority of them widely distribute in central to northern Japan. The species occur in Sugadaira are 43, for example, *Bazzania bidentula*, *Schiffneria hyalina*, *Frullania hamatiloba* which are growing in broad-leaved deciduous forest below 1700 m. alt., in Sugadaira. The species known from Rishiri and Rebun Isls. are 44, for example, *Scapania curta*, *Tritomaria quinquedentata* and *Preissia quadrata* which are growing in sub-alpine region of Rishiri and Rebun Isls. above 1000 m. alt.

B. The species common to the present area and Mt. Ontake are 63, most of them are commonly growing in central Japan. The species which occur in Sugadaira are 22, for example, *Jungermannia hattoriana*, *Xenochila integrifolia* and *Radula japonica* which occur in Sugadaira Moor, Daimyojin-sawa and broad-leaved forest near springs, between 1200—1400 m. alt. The species known from Ms. Ontake are 77, for example, *Porella japonica*, *Nowellia curvifolia*, *Frullania delavayi* and *Bazzania tricenata* which occur in *Quercus mongolica* forest, *Tsuga diversifolia* forest or in *Abies* forest very commonly or as dominant species.

C. The species common to the present area and Chichibu Mts. are 73, most of them are commonly growing in central Japan. The species known from Sugadaira are 12, for example, *Chandonanthus pusillus*, *Jungermannia therumarum*, *Marsupella sphacelata* and *Antheria juratzkana* which are rather rare species or growing on specific substrata (acidic rocks). The species known from Chichibu Mts. are 173, for



example, *Anastrepta orcadensis*, *Cheilolejeunea obtusifolia*, *Porella setigera*, *Bazzania tricenata* and *Lepidozia filamentosa* which are commonly growing in broad-leaved forest (*Quercus*, *Betula*) and in coniferous forest (*Tsuga*, *Abies*) between 500—2500 m. alt, or growing on specific substrata (limestone).

## II). Musci

A. The species common to the present area and Rishiri and Rebun Isls. are 129, most of them commonly distribute in central to northern Japan. The species known from Sugadaira are 120, for example, *Dicranum japonicum*, *Glyphomitrium humillimum*, *Bryum giganteum*, *Orthotrichum amabile* and *Okamuraea brevipes* which are growing in Sugadaira Moor, Daimyojin-sawa and broad-leaved forest with springs, between 1200—1700 m. alt. The species known from Rishiri and Rebun Isls. are 85 for example, *Tetraphis geniculata*, *Pohlia prolifera*, *Neckera pennata*, *Honomallium incurvatum* and *Rhytidiadelphus triquetrus* which are commonly growing in broad-leaved forest or in coniferous forest in Rishiri and Rebun Isls.

B. The species common to the present area and Mt. Ontake are 130, most of them very commonly occur in central Japan. The species known from Sugadaira are 119, for example, *Dichodontium pellucidum*, *Bryum cyclophyllum*, *Orthotrichum sordidum*, *Claopodium pellucinerve* and *Brhynia tokubuchii* which occur in Sugadaira Moor, Daimyojin-sawa and broad-leaved forest between 1200—1400 m. alt., or rare species. The species known from Mt. Ontake are 109, for example, *Leucodon exaltatus*, *Anomodon abbreviatus*, *Hylocomium umbratum*, *Oligotrichum hercynianum*, *Dolichomitria cymbifolia* and *Neckera konoii*, which are growing in broad-leaved forest (*Quercus*, *Betula*) or in coniferous forest (*Tsuga*, *Abies*). The dominant species in Mt. Ontake are *Boulaya mittenii*, *Glyphomitrium humillimum*, *Hylocomium splendens* and *Lesquereuxia robusta* which are also known from Sugadaira, however, they are very few in number.

C. The species common to the present area and Chichibu Mts. are 177, most of them commonly occur in central Japan. The species known from Sugadaira are 72, for example, *Saellania glaucescens*, *Grimmia olympica*, *Ulota drummondii*, *Leskea pusilla*, *Amblystegium kochii* and *Brhynia tokubuchii* which occur in Sugadaira Moor, or in broad-leaved forest with some springs, or they are rare species. The species known from Chichibu Mts. are 216, for example, *Leucodon exaltatus*, *Pterobryum arbuscula*, *Neckera pennata*, *Miyabea fruticella* and *Rhytidiadelphus triquetrus* which occur in broad-leaved forest (*Quercus*, *Betula*) or in coniferous forest (*Tsuga*, *Abies*) very commonly, and *Fissidens grandifrons*, *Barbula gigantea*, *Tortella fortunea* *Trachypus bicolor* which usually grow on limestone.

## Discussion

The number of species of Hepaticae in Sugadaira is fewer than that of Mt. Ontake and Chichibu Mts. and the common species to those area are few, however its percentage are higher than that of Musci. According to this fact, the liverworts of Sugadaira

are merely composed of very common species in central Japan, and lacks the species occurring in the broad-leaved forests or in coniferous forests of Mt. Ontake and Chichibu Mts.

The common species of mosses with those of compared area very commonly distribute in Honshu and Hokkaido. Common species with Rishiri and Rebun Isls. are almost occur above 1600 m. in Sugadaira, although those species common with Mt. Ontake and Chichibu Mts. and they occur throughout in Sugadaira. However, there are some remarkable species which occur in Sugadaira Moor or in broad-leaved forests with springs. The species in the broad leaved forests or in the coniferous forests of Mt. Ontake and Chichibu Mts. and they are absent from, or very poorly present in Sugadaira area.

As the result of the destruction of nature, there remains very few natural flora in Sugadaira. Therefore, Bryophyte flora of Sugadaira is simple and common in central Japan, except that there occur some hygrophytic species. It seems that the bryophyte flora is much effected, especially on hepatics.

Comparison of the bryophyte flora of Sugadaira with those of other mountains and islands in Japan.

1. Hepaticae

Comparised area	Number of species recorded	Number of common species to Sugadaira (=α)	$\frac{\alpha}{\text{Sugadaira (=87)}} \times 100$
Rebun & Rishiri Isls. (Hattori, 1962)	86	42	48.3%
Mt. Ontake (Hattori, 1958)	140	63	72.4%
Chichibu Mts. (Inoue, 1962)	246	73	83.9%

2. Musci

Comparised area	Number of species recorded	Number of common species to Sugadaira (=β)	$\frac{\beta}{\text{Sugadaira (=249)}} \times 100$
Rebun & Rishiri Isls. (Iwatsuki, 1962)	214	129	51.8%
Mt. Ontake (Noguchi, 1958)	239	131	52.6%
Chichibu Mts. (Nagano, 1962)	393	177	71.1%

Literature Cited

- Hattori, S. 1967. Hepaticae of Hokkaido. II. Rishiri and Rebun islands. Journ. Hattori Bot. Lab. 18 : 78—92.

- . 1958. The Hepaticae of Ontake mountain, middle Japan. Journ. Hattori Bot. Lab. 20: 33—53.
- 飯沼冬彦 1968. 菅平の蘚苔類について 菅平植物誌: 85—95.
- Inoue, H. 1962. Hepaticae and Anthocerotae of the Chichibu-Okutama mountains, central Japan. Journ. Hattori Bot. Lab. 25: 186—206.
- Iwatsuki, Z. 1962. Mosses of Rishiri and Rebun islands, northern Japan. Journ. Hattori Bot. Lab. 25: 107—125.
- . 1965. Studies on the epiphytic moss flora of Japan. 14. Journ. Hattori Bot. Lab. 28: 157, 163.
- 永野 巖 1962. 埼玉県植物誌: 266—238.
- Noguchi, A. 1953. Musci Japonici III. The genus *Okamuraea*. Journ. Hattori Bot. Lab. 9: 10.
- . 1958. A list of mosses from Mt. Ontake, central Japan. Journ. Hattori Bot. Lab. 20: 272—288.
- 野口 彰・斉藤亀三 1970 *Grimmia olympica* E. G. Britton は日本にも産する。蘚苔地衣雑報 5: 104—105.
- Sakurai, K. 1934. Beobachtungen über Japanische Moosflora VI. Bot. Mag. Tokyo 48: 384.
- 斉藤亀三 1970. *Zygodon viridissimus* (Dicks.) Brid. とその変種について。蘚苔地衣雑報 5: 91—92.
- Takaki, N. 1943 a. Bericht über Laubmoosflora von Sugadaira, prov. Sinano. (I). Jap. Journ. Bo. 19: 172—
- . 1943 b. ———. (II). Jap. Journ. Bot. 19: 405—413.
- . 1949. Notes on Japanese Moss Flora (I). Jour. Jap. Bot. 23: 8.
- . 1950. Contributions to the moss flora of mountainous district in central Japan. I. Bot. Mag. Tokyo 64: 179.
- . 1956. Researches on the Brachytheciaceae of Japan and its adjacent areas. III. Journ. Hattori Bot. Lab. 16: 55.
- . 1958. 木曾御岳の蘚苔類植生 Journ. Hattori Bot. Lab. 20: 245—271.
- . 1964. A revision of Japanese Dicranum. Journ. Hattori Bot. Lab. 27: 91.

## 摘 要

長野県菅平のコケ植物フロラについて、1968—69年に調査を行ない、これまでに報告されたものも含め、タイ類22科39属85種、ツノゴケ類1科1属1種、セン類40種105属242種を記録した。その中で *Crimmia olympia* E. G. Britton (ヒメギボウソゴケ 新称) と *Zygodon viridissimus* (Dicks.) Brid. (ミドリコモチゴケ 新称) の2種は、日本新産である。又これまでに報告されたもののうち9種が除かれた。

菅平のコケ植物フロラは、御岳のコケ植物フロラに比較的似ているが、菅平では開発が進み、農耕地、牧草地が多く自然林が少いために、コケ植物フロラが貧弱になっており、特に

タイ類では強い影響をうけて種類数が少なくなっており湿原に生じる種を除けば単純な中部日本の一般的なフロラである。

(Botanical Institute, Faculty of Science, Tokyo Kyoik University : 東京教育大学理学部植物学教室)

#### Explanations of Plates

Plate I. *Xenochila integrifolia* (Mitt.) Inoue,

1. Part of plant ( $\times 13$ ).
2. Apex of gemmiferous shoot ( $\times 27$ ).
- 3, 4. Leaves ( $\times 25$ ).
5. Leaf from gemmiferous shoot ( $\times 100$ ).
6. Cells from leaf margin ( $\times 66$ ).
7. Propagule ( $\times 265$ ).
8. Oil bodies ( $\times 1033$ ).

Plate II. *Jungermannia exertifolia* Steph.

1. Part of plant ( $\times 13$ ).
- 2, 3. Leaves ( $\times 22$ ).
4. Cells from leaf margin ( $\times 410$ ).
5. Cells from leaf middle ( $\times 410$ ).
6. Cells from leaf basal angle ( $\times 410$ ).
7. Cells from leaf base ( $\times 410$ ).
8. Cross section of stem. ( $\times 265$ ).

Plate III. *Dicranella subulata* (Hedw.) Schimp.

1. Plant ( $\times 13$ ).
- 2, 3, 4. Perichaetial leaves ( $\times 27$ ).
- 5, 6, 7. Leaves ( $\times 27$ ).
8. Basal angle of leaf ( $\times 410$ ).
9. Cells from shoulder part of leaf ( $\times 410$ ).
10. Cross section of stem ( $\times 40$ ).
11. Exothecial cells (surface view) ( $\times 410$ ).
12. Transverse section of exothecial cells ( $\times 410$ ).
13. Cross section of seta ( $\times 410$ ).
14. Peristome tooth (outer view) ( $\times 265$ ).
15. Spores ( $\times 410$ ).

