

Mosses of British Columbia, especially Wells Gray Provincial Park

TEUVO AHTI and REINO FAGERSTÉN

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I. Introduction

Most of British Columbia is bryologically still very poorly known and the few data that have been published are very scattered. This applies particularly to the inland areas of this wide province. Admittedly, the fairly large collections of JOHN MACOUN have been published (e.g. MACOUN & KINDBERG 1892, MACOUN 1902) but among the identifications, chiefly made by KINDBERG, there are numerous errors. Other more extensive lists of mosses of British Columbia have been prepared by HILL (1911), MACFADDEN (1927), KUJALA (1945, pp. 426–434), KRAJINA (1959), PORSILD & GRUM (1961), and SCHOFIELD (1965), but not all of them include precise localities or ecological data. Numerous monographs and other taxonomic papers, as well as the moss flora of North America by GROUPE (1928–40), also contain quite a few records from British Columbia. It is the coastal flora that has been the main object of interest to many bryologists. In fact, MACFADDEN'S (1929) romantic description of the province as the bryologist's paradise, because of its highly variable nature, is no exaggeration.

A more important source of information on the moss flora of British Columbia is undoubtedly the herbarium of the University of British Columbia (UBC) in Vancouver, where a large number of bryophyte collections have been deposited in recent years. Another important herbarium is the National Herbarium of Canada (CAN) in Ottawa, where, for example, the first set of MACOUN'S collections is housed.

The purpose of the present paper is to list all the bryophytes, excluding hepatics, that were collected by Drs. LEENA HÄMET-AHTI and TEUVO AHTI (labelled 'Leena and Teuvo Ahti') in British Columbia during two months in the summer of 1961. Most of the collections are from Wells Gray Provincial Park, which is situated in the east-central part of the province (Fig. 1). A smaller number of specimens were gathered in a few places in the southwestern part of the province, including Vancouver Island. All this collecting was done in connexion with studies on epiphytic lichens (AHTI 1962) as well as on forest and meadow vegetation and the higher plant flora (HÄMET-AHTI 1965 a, 1965 b) in the Wells Gray Park area. Further, a small number of specimens collected by TEUVO AHTI in the province in 1958 are listed here. This material amounts to about 710 specimens.

In addition, a considerable collection (about 300 packets) made by Dr. VILJO KUJALA, of Helsinki, during his studies on forest ecology in various parts of southern and central British Columbia in 1931 (KUJALA 1945), have been included in this paper. However, a small number of his specimens, including a few that were probably already deposited in the herbarium in Helsinki (it was not checked throughout) and some difficult ones have been omitted. KUJALA received some duplicates, mainly collected around Victoria, Vancouver Island, from E. C. MACKENZIE, and they are also listed here.

Finally, a few specimens collected by Dr. YRJÖ ILVESSALO in connexion with a study on forest types (ILVESSALO 1929) and deposited in the herbarium of the Forest Research Institute, Helsinki (HFR), are mentioned.

In all, the material comprises about 1 000 specimens, excluding duplicates. The first set is deposited in the Botanical Museum, University of Helsinki (H), Finland, but a representative set of duplicates has been sent to UBC.

Most of the material collected by KUJALA was identified in the 1930's by Dr. HEIKKI ROIVAINEN but also checked

by us. The *Sphagnum* specimens were chiefly identified by Dr. PEKKA ISOVIITA, of Helsinki, but some were confirmed by Dr. W. S. G. MAASS, of Halifax, Nova Scotia. Mr. TIMO KOPONEN identified some species of *Mnium*. Dr. RISTO TUOMIKOSKI read our manuscript and made some valuable comments. We express our sincerest thanks to these persons.

The help given by the personnel of Parks Branch, British Columbia Department of Recreation and Conservation, Victoria, B.C., is gratefully acknowledged. Financial support during the identification stage was received from the Finnish National Research Council for Sciences.

The identification of the majority of the specimens was completed by the second author (FAGERSTÉN). The first author (AHTI) assisted in the identification and is responsible for a number of sight records and other field notes, in addition to the general chapters.

II. Phytogeographic observations

Recently, SCHOFIELD (1965, pp. 22 – 23) gave a good general review of the relations of bryophyte distribution and climate in British Columbia. A map of the vegetation zones (biogeoclimatic zones) of the province was published by KRAJINA (1965). Another similar, though less detailed, map was compiled by HÄMET-AHTI (1965 b, p. 294), who attempted to link the nomenclature of the mountain zones with that of the circumpolar transcontinental zonation, instead of using the more local terms of KRAJINA and others.

In all these studies the great oceanicity of most of the coastal area with its high precipitation and characteristic flora and vegetation is stressed. The interior plains and mountains are mostly drier, although the oceanic characters are to some extent repeated in the mountains, which are mainly western foothills of the Rocky Mountains. These latter regions form an area that is generally called the Interior Wet Belt. Many of the valley bottoms of southern British Columbia are more or less arid, while the upper elevations in the same general areas are fairly wet (see e.g. KENDREW & KERR 1955).

Because of the mountainous relief the vertical differences in the thermal conditions are also very pronounced. Perhaps most of the vegetation in southern British Columbia (on mountain slopes) corresponds climatically to the more northern boreal lowland zones, while the southwestern corner is clearly temperate (boreo-meridional) and the tops of the mountains arctic (oroarctic).

Calcareous soils are very widespread in British Columbia but highly acid soils are also common. The rock outcrops are very variable

in their properties as bryophyte habitats but over wide areas bare rocks may be exceptional.

Wells Gray Provincial Park, which is situated in the southern Cariboo Mountains at approximately lat. 52° N, and long. 120° W, is a characteristic section of the Interior Wet Belt. The altitude ranges from 600 m (2 000 feet) to 2 600 m (8 500 feet). The timber-line lies at about 2 000 m. Besides the great variations in temperature there are considerable differences in moisture conditions. The annual precipitation, for instance, varies from about 580 mm (23 in.) to a little more than 1 000 mm (40 in.), sometimes within a few miles. Concerning the ecological conditions in the park, see HÄMET-AHTI (1965 a, 1965 b).

In the present paper about 259 species of mosses are reported from British Columbia. The total number of species known from the province is about 550 (SCHOFIELD 1965, p. 21). The records from the coast chiefly relate to very common species and are based on rather few collections. However, since the material is not readily available in B.C. we decided to publish it.

The Wells Gray Park records are probably fairly representative of an interior mountain region (170 species recorded). The area is situated about 200 miles from the nearest coastline but open sea is about 350 miles distant. Among climatic distributional elements the completely circumpolar arctic to boreal (to temperate) group clearly predominates. Another major group is the more or less oceanic element, which includes (1) species confined to western North America, (2) species common to western North America and eastern Asia, i.e. the North Pacific

element (e.g. SCHOFIELD 1965), (3) species present around the North Pacific and in western Eurasia, and (4) species found along the east and west coasts of both North America and Eurasia, i.e. the so-called circumpolar oceanic element. It is quite apparent that at least in most cases the restricted distribution of these species in the west of North America is due not solely to historical causes but also to the fact that they require an oceanic climate, being incapable of spreading to continental areas east of the Rocky Mountains. This idea is supported by the observation that in the less oceanic interior areas these species are less frequent than on the highly oceanic coast. In the interior they are usually found only in microclimatically exceptional sites, such as waterfalls, rapids, lake shores, etc. A small number of the western species – perhaps some of them are not oceanic at all – can be said to be common in the Wells Gray Park area (in suitable zones), e.g. *Roellia roellii*, *Mnium nudum*, *Brachythecium hylotapelum*, *Rhytidiopsis robusta*, *Dicranum pallidisetum*, *Polytrichadelphus lyallii*. About a quarter of the Wells Gray Park moss flora belongs to this group.

Below, all the species that are believed to be more or less oceanic (some having weak oceanic tendencies only) and present in our material from eastern British Columbia are listed. If found in Alberta (always in the Rocky Mountains or adjacent hilly areas!) according to BIRD (1966), this is mentioned in parentheses after the name. The species in brackets were not found in the Wells Gray Park region.

Sphagnum inundatum
[*S. mendocinum*]
Ditrichum heteromallum
Blindia acuta (also Alberta?)
Dicranella palustris (also Alberta)
Paraleucobryum enerve (also Alberta)
Amphidium mougeotii (also Alberta)
Dichodontium pellucidum
Kiaeria starkei (also Alberta)
Dicranum pallidisetum (also Alberta)

[*Leucobryum glaucum* (also Alberta?)]
Anoetangium aestivum
Scouleria aquatica
Grimmia mollis
Schistidium agassizii (also Alberta)
Rhacomitrium aciculare (also Alberta?)
R. fasciculare (also Alberta)
R. patens (also Alberta)
R. sudeticum (also Alberta?)
[*Schistostega pennata* (also Alberta)]
Roellia roellii
Mnium insigne
M. nudum
Aulacomnium androgynum (also Alberta)
Antitrichia curtipendula var. *gigantea*
Neckera menziesii (also Alberta)
Thamnobryum leibergii (also Alberta)
Lescurea radicata (also Alberta)
Heterocladium procurrens
Claopodium bolanderi
Brachythecium hylotapelum (also Alberta)
B. nelsonii (also Alberta)
[*Eurhynchium substrigosum*]
Pterigynandrum filiforme (also Alberta)
Hypnum circinale
H. dieckii
[*Isopterygium borrierianum*]
Rhytidiopsis robusta (also Alberta)
Rhytidiadelphus loreus (also Alberta)
[*Hylocomium umbratum*]
Oligotrichum hercynicum
O. parallelum
Polytrichum formosum
P. norvegicum (also Alberta)
Polytrichadelphus lyallii

In the vascular plant flora of the Wells Gray Park area there are some representatives of the essentially eastern North American flora (e.g. *Carex trisperma*, *Geocaldon lividum*, *Vaccinium myrtilloides*) as well as some species characteristic of the arid areas of the continent (cf. HÄMET-AHTI 1965 a, p. 143). Similar elements are also seen in the bird fauna of the park (e.g. EDWARDS & RITCEY 1967, p. 7). In the moss flora *Homalothecium nevadense* might be included in the latter element. The eastern element could include the following species: *Sphagnum jensenii*, *S. wulfianum*, *Mnium ciliare*, *M. drummondii*, *M. medium*, *M. rugicum* and *Dicranum drummondii*.

III. Collecting localities

The list of collecting localities of AHTI and HÄMET-AHTI is arranged according to the vegetation zones and sections proposed by HÄMET-AHTI (1965 b). However, the zone or subzone in which the same place is apparently included in KRAJINA'S (1965) system is indicated in

parentheses. On the labels of the Wells Gray Park specimens the following temporary names of the zones were used: lower *Tsuga* zone (= lower oroboreal zone), upper *Tsuga* zone (= middle oroboreal zone), lower subalpine zone (= upper oroboreal zone), upper subalpine zone

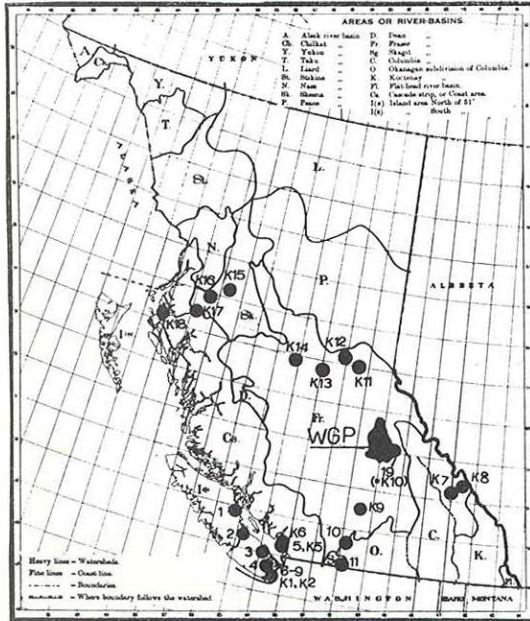


Fig. 1. The localities where collections were made (see pp. 425–427). The figures K1–K18 refer to the collecting localities of V. Kujala (p. 427). WGP = Wells Gray Park.

(= orohemiarctic zone), and alpine zone (= lower oroarctic zone). The major localities are mapped in Fig. 1. The places in the Wells Gray Park area are to be found in Fig. 2. The year of collection is 1961, if not otherwise indicated.

The collecting localities of V. KUJALA are merely listed according to KUJALA (1945, pp. 394–402), though in inverse order. For their location, Fig. 1 and KUJALA'S map (op. cit., p. 127) should be consulted.

Humid northern boreomeric zone (Madroño – Douglas fir subzone)

Vancouver Island

1. Miracle Beach Provincial Park (S of Oyster River). Old dense giant conifer forests. June 12.
2. Little Qualicum Falls Provincial Park (W of Parksville). Open *Pseudotsuga* forest on sand and rock outcrops near the falls. June 12.
3. Ladysmith, Ivy Green Provincial Park. Old, dense giant conifer forest. June 12.
4. Bamberton Provincial Park (near Mill's Bay). Old dense giant conifer forest. June 12.

Vancouver

5. Vancouver, Stanley Park. Old dense coniferous forest. August 12.

Vancouver Island

6. Goldstream, Mt. Wells. Open forest on rock outcrops. September 30, 1958.
7. Victoria, Oak Bay, 2264 Windsor Road. Lawn and fruit trees in home garden. June 10.
8. Victoria, Uplands Park. Open *Quercus garryana* woodland, old pasture and open rock outcrops. June 11.
9. Victoria, parks of Pioneer Square and Government House. August 6.

Dry hemiboreal zone (Interior Douglas fir zone)

Tulameen

10. North of Tulameen (NW of Princeton), Mt. Rabbit, Lawless (Bear) Creek, 3500 ft., 49°33' N, 120°50' W. Dry open *Pinus ponderosa* and *Pseudotsuga menziesii* woodlands with rock outcrops and a gorge of the creek. October 2–3, 1958.

Dry lower oroboreal zone (Engelmann spruce – subalpine fir zone)

Manning Park

11. E. C. Manning Provincial Park, Pinewoods. Dry *Pinus contorta* forest and rock outcrops. June 13.

Humid lower oroboreal zone (Interior western hemlock zone)

Wells Gray Park road

12. Hemp Creek, near south entrance to Wells Gray Provincial Park. Open 35-year-old *Populus tremuloides* forest in old burn, pastures and brookside. June 16, 17, 18, 19, July 4, 5, 6, 8, 9, 17, 31, August 3.

Wells Gray Park

13. Hemp Creek, Ca. 1–1.5 mi. NW of the Hemp Creek Ranger Station. Old *Thuja plicata* forest, young *Pinus contorta* and *Pseudotsuga menziesii* forests, eutrophic fen, and brooks. June 17, July 13, August 1.
14. Murtle River, Mushroom Falls. Open rock bed and cliffs on the river, fairly young *Pinus contorta* and *Populus tremuloides* forests. June 20, July 7.
15. Murtle River, above Helmcken Falls and on Helmcken Falls Trail. Old *Tsuga* forests, mist-sprayed by the falls, and younger mixed *Populus tremuloides* forests along the Murtle River. July 7.
16. S end of Clearwater Lake. Middle-aged forests with *Abies lasiocarpa* etc. along lake shore. June 15.
17. Azure Lake, two places 3 and 4 mi. E of the western end. Rocky forests, mainly *Tsuga heterophylla*, on and near the lake. July 14.
18. Azure Lake, Rainbow Falls near the mouth of Angus Horne Creek. Rich *Tsuga* forest and wet cliffs constantly mist-sprayed by the falls. July 14.

Blue River

19. Ca. 2–5 mi. SW of the Blue River station (a few specimens collected by the station). Old *Tsuga heterophylla* forests. July 12.

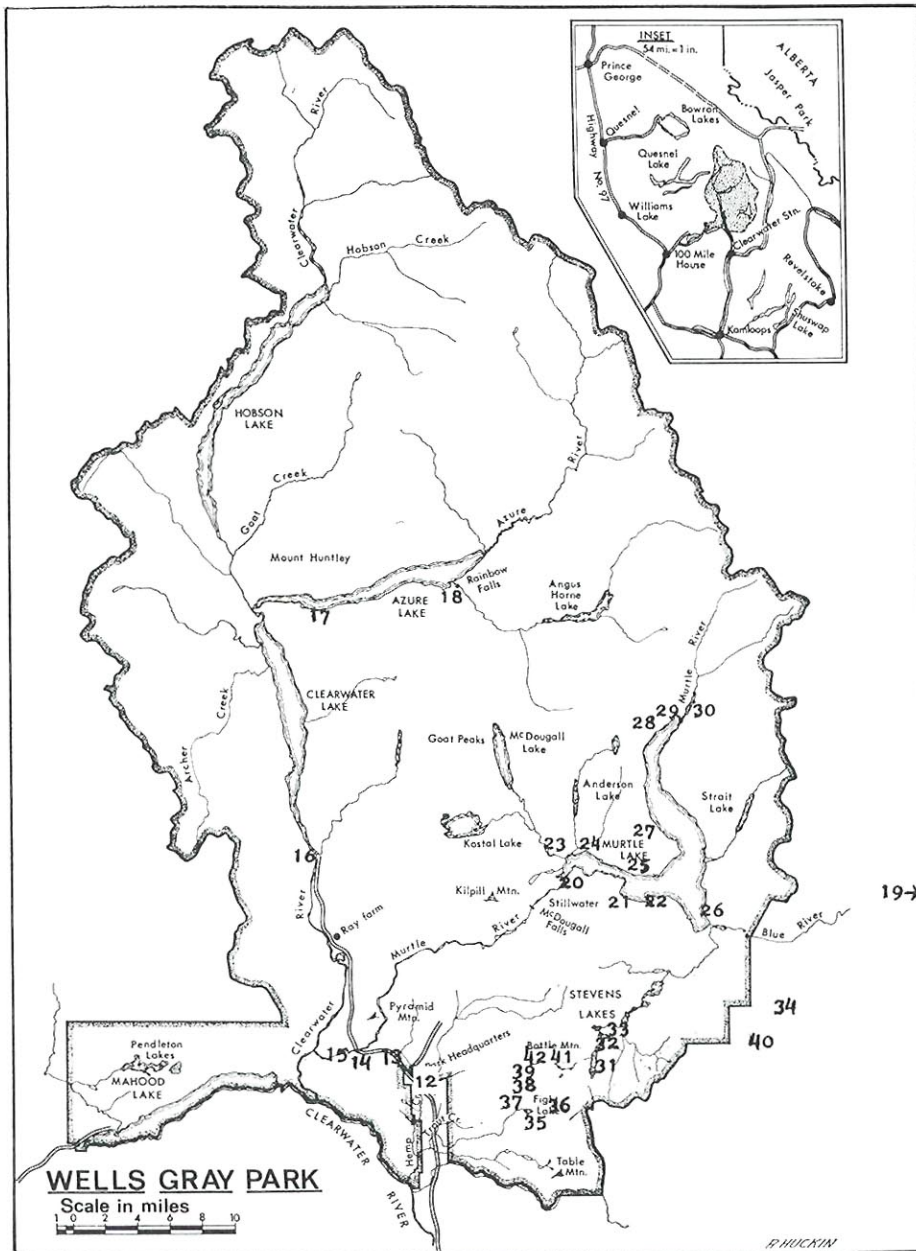


Fig. 2. The collecting localities in the Wells Gray Park area.

Middle oroboreal zone (Interior western hemlock zone)

Wells Gray Park

20. Murtle Lake, Diamond Lake (= SW end of Murtle L.). Meso-eutrophic fens, dry to moist forests dominated by *Thuja plicata*, *Abies lasiocarpa*, and *Picea engelmannii*,

river stones and shores where Murtle River leaves the lake. June 23, 25, 26, 29, 30. July 2.

21. Murtle Lake, S shore of the western arm, ca. 1.5 mi. W of the patrolman's cabin. Swampy forests with *Picea engelmannii* and *Abies lasiocarpa*. July 3.

22. Murtle Lake, S shore of the western arm, east side of the patrolman's cabin. Old *Tsuga* and *Thuja* forests. June 27.

23. W end, 0.5 mi. N of the mouth of File Creek. Mesotrophic fens and swampy *Picea engelmannii* forest. July 1.
24. Murtle Lake, N shore of the western arm, ca. 1.5 mi. E of mouth of Anderson Creek. Old *Thuja* forest with a big erratic block. July 1.
25. Murtle Lake, N shore of the western arm, foot of Ramsay Mtn. Extensive, partly wooded, partly open boulder bed, with some calcareous boulders. July 1.
26. Murtle Lake, SE end, around mouth of Snookwa Creek. Sandy *Pinus contorta* woodland, various other woodlands, stones in a brook. June 24.
27. Murtle Lake, SW shore of the northern arm, ca. 6.5 mi. S of mouth of Vachon Creek. Low calcareous rock outcrops on lake, old *Tsuga* forest. June 28.
28. Murtle Lake, NW shore of the western arm, at the mouth and 1 mi. NE of the mouth of Vachon Creek. Old *Thuja* forest. June 28.
29. Murtle Lake, N end, at the mouth of Murtle River. Sandy *Picea engelmannii* forest. June 28.
30. Murtle Lake, N end, ca. 1 mi. up the Murtle River. Mesotrophic and eutrophic treeless fens, moist and wet alluvial forests. June 28.

Upper oroboreal zone (Engelmann spruce – subalpine fir zone)

Wells Gray Park

31. Stevens Lakes, S and E shores of the southernmost Stevens Lake. Mesotrophic and eutrophic fens, alluvial lake shore, swampy spruce forest. July 25, 26.
32. Stevens Lakes, N end of the southernmost Stevens Lake. Swampy and mesic coniferous forests, various peatlands. July 25, 26.
33. Stevens Lakes, ca. 1–3 mi. NE of the southernmost of Stevens Lakes. Eutrophic fen, *Pinus contorta* forests on sand. July 25, 26.

Blue River

34. Fish Lake Hill (ca. 10–12 mi. SW of Blue River Station). Various types of *Abies lasiocarpa* – *Picea engelmannii* forests, oligotrophic and mesotrophic fens. July 11.

Orohemiarctic zone (Engelmann spruce – subalpine fir zone)

Wells Gray Park

35. Battle Mtn., S slope, ca. 0.5 mi. S of Fight Lake, Caribou Meadows. Treeless dry to moist meadows, open *Abies* – *Picea* forests. July 22.
36. Battle Mtn., E slope, ca. 1 mi. SW of the southernmost of Stevens Lakes. Burnt and virgin *Abies* – *Picea* forest. July 26.
37. Battle Mtn., S slope, Fight Lake Meadow. Treeless dry to moist meadows, open *Abies* – *Picea* forests, spring-fed brooks. July 19, 20, 21, 28 (etc.).
38. Battle Mtn., S slope, '52 Ridge'. Treeless or sparsely wooded dry to moist meadows. July 23.
39. Battle Mtn., S slope, Bowl Valley. As in 38. July 23.

Blue River

40. Fish Lake Hill (ca. 11–12 mi. SW of Blue River Station). Dry to moist meadows and open *Abies* – *Picea* woodlands.

Lower oroarctic zone (Alpine zone)

Wells Gray Park

41. Battle Mtn., the highest peak (2 290 m or 7 635 feet). Rock bed, thin soil along small brooks around snow beds, and in more sheltered depressions. July 23.
42. Battle Mtn., SW peak. As in 41. July 23.

Collecting localities of V. Kujala in 1931

Vancouver Island

1. Victoria
2. Langford
3. Between Victoria and Cowichan Lake, four stops on highway (labelled 'West Coast I, II, III, IV'). Locations unfortunately not exactly known (comm. by V. KUJALA)
4. Cowichan Lake

Vancouver City region

5. Vancouver, Stanley Park
6. Capilano and Capilano Canyon, North Vancouver

Kootenay District

7. Golden
8. Field

Yale District

9. Kamloops (some from Trout Lake, ca. 20 mi. SW of Kamloops town)
10. Blue River (and on railway between Blue River and Valemount stations)

Cariboo District

11. Longworth
12. Aleza Lake
13. Six Mile Lake (Tabor Lake) near Prince George
14. Vanderhoof

Prince Rupert District

15. Hazelton
16. Dorreen
17. Terrace
18. Prince Rupert.

It may be mentioned that KUJALA (1945) also reported mosses from other localities, but no moss collections were made.

IV. List of species

The nomenclature of the taxa listed does not follow any standard catalogue. However, the name used in the checklist by CRUM, STEERE & ANDERSON (1966) is indicated in parentheses (without author citation) after the name adopted by us, if not the same. Our family system is identical with that used in the checklist quoted. In the same list (op. cit., p. 378) the preposition *ex* is applied instead of *in* in the author citations. We prefer to retain *in* when necessary, which results in differently abbreviated citations in a number of cases. However, not being able to check all cases, we have used abbreviated citations only in *Sphagnum* – which has been treated in accordance with ISOVIITA's (1966) revision – and some other groups familiar to us.

The numbers of the collecting localities of the AHTIS are followed by the numbers of the specimens, which are in italics and in parentheses. When no specimen number is indicated, the record is based either on sample plot records, of which the data on forest plots were published by HÄMET-AHTI (1965 b)¹, or on other field notes. Several species were poorly collected if they were found to be common, while some others were gathered each time they were seen. Thus the data in connexion with the species are not all based on the specimens only. The localities are arranged according to the major areas: Vancouver Island, Vancouver, Manning Park, Tulameen, Wells Gray Park road, Wells Gray Park (within that Hemp Creek, Murtle River, Clearwater Lake, Azure Lake, Murtle Lake, Stevens Lakes, Battle Mountain), and Blue River.

The collections of KUJALA, MACKENZIE, and ILVESSALO (all unnumbered) are listed separately according to the collector. No reference to KUJALA'S (1945) published records is usually made.

Abbreviations:

CSA = reference to CRUM, STEERE & ANDERSON (1966)
ECM = collected by E. C. MACKENZIE

VK = collected by V. KUJALA (or rarely AARNO CAJANDER)

WGP = Wells Gray Provincial Park

Y1 = collected by Y. ILVESSALO

*Sphagnaceae*¹

Sphagnum angustifolium (Russow) C. Jens. (CSA: *S. recurvum* var. *tenue*) – WGP: Murtle Lake 20 (13246, 13239, 13296) common in mesotrophic to meso-eutrophic fens, 30 (13469) mesotrophic sedge swamp. – VK: Capilano, moist *Lysichiton* stand; Aleza Lake.

S. centrale C. Jens. – WGP: Murtle Lake 21 (13200) mesotrophic alluvial fen, 30 (13468) mesotrophic sedge swamp.

S. compactum Brid. – WGP: Battle Mtn. 35 (14090) moist *Carex nigricans* meadow. – Blue River: 34 (13976) oligotrophic fen on small pond.

S. sp. aff. cuspidatum Hoffm. – VK: Prince Rupert.

S. fallax (Klinggr.) Klinggr. em. Isov. (CSA: incl. in *S. recurvum*; *S. apiculatum* H. Lindb.; *S. recurvum* var. *muconatum* (Russow) Warnst.) – WGP: 20 (13247, 13307) wet mesotrophic swamp forest and mesotrophic alluvial fen.

S. fuscum (Schimp.) Klinggr. – WGP: Hemp Creek 13 (14006) forming hummocks in small eutrophic fen; Battle Mtn. 39 (14255) on wet rocks along a brook. – Rare in WGP. – VK: Capilano, bog forests; Six Mile Lake; Prince Rupert, bog forest.

S. girgensohnii Russow – WGP: Stevens Lakes 33 (15386) boulder bed in moist forest.

S. cf. inundatum Russow (CSA: incl. in *S. subsecundum*) – WGP: Murtle Lake 20 (13224) meso-eutrophic alluvial fen on lake shore, sparsely.

This species, which is not usually recognized in North America, belongs to the somewhat oceanic element in WGP.

S. jensenii H. Lindb. (CSA: incl. in *S. dusenii*; *S. annulatum* var. *porosum* (H. Lindb.) Maass & Isov.) – WGP: Murtle Lake 21 (13780) wet hollow in oligotrophic bog forest, 30 (13443) large wet mesotrophic fen. – Blue River: 40 (13966, 13970) mesotrophic fens.

The ecological behaviour of this overlooked species seems to correspond exactly to that observed in northern Europe: it prefers large open oligotrophic to mesotrophic fens of upper and middle (oro)boreal zones. Although it seems to be common in upper elevations of WGP, there are very few additional collections from B.C. (see MAASS 1967).

S. magellanicum Brid. – WGP: Murtle Lake 30 (13470) mesotrophic sedge swamp. – VK: Capilano, bog forest; Aleza Lake; Prince Rupert.

S. mendocinum Sull. & Lesq. – VK: Cowichan Lake; Aleza Lake, in swamp forest dominated by *Picea engelmannii*, *Alnus tenuifolia*, *Spiraea douglasii*, and *Equisetum sylvaticum* (see KUJALA 1945, pp. 353–359, plot no. 81).

S. nemoreum Scop. (CSA: *S. capillaceum*) – WGP: Murtle Lake 20 (13442) hummocks in fen. – Blue River: 40 (13980) mesic timber-line meadow. – VK: Capilano, bog forest; Field.

S. palustre L. – VK: Vancouver, Stanley Park, *Lysichiton* stand on wet ground; Capilano, bog forest; Prince Rupert, bog forest.

S. platyphyllum (Braithw.) Warnst. (CSA: incl. in *S. subsecundum*) – Blue River: 40 (13969) wet mesotrophic fen.

¹ In that paper (p. 285) the sample plots 42 and 43 are erroneously stated to be located in the same place as the plots 27–32. Delete ' = 27–32' and insert ' = 37–38'. In the same paper there are some moss names which were based on our misidentifications; see under *Dicranum pallidisetum*, *Mnium drummondii*, *Brachythecium campestre*, *Hypnum subimponens*, and *Polytrichadelphus lyallii* in the present paper.

¹ All specimens identified or checked by Dr. PEKKA ISOVIITA.

S. riparium Ångstr. – WGP: Murtle Lake 30 (13465) mesotrophic alluvial sedge swamp.

S. rubellum Wils. (CSA: *S. capillaceum* var. *tenellum*) – VK: Prince Rupert, bog forest.

S. russowii Warnst. (CSA: *S. robustum*) – WGP: Murtle Lake 23 (13629) moist forest; Battle Mtn. 35 (14091) moist *Carex nigricans* meadow, 37 (14089) *Carex nigricans* meadow. – Blue River: 34 (13914, 13931) abundant in small oligotrophic fens, 40 (13912, 13962) wet mesotrophic fens.

Dr. ISOVITTA noted that some specimens appeared as if less sharply distinguishable from *S. nemoreum* than in North European material.

S. squarrosum Crome – WGP: Murtle Lake 23 (13580) moist forest. – VK: Vancouver, Stanley Park, swamp forest.

S. subsecundum Nees s. str. – WGP: Murtle Lake 20 (13223, 13228) meso-eutrophic alluvial fen on lake shore, 30 (13466) wet mesotrophic fen; Battle Mtn. 37 (14087, 14141) shallow pools and on small brook in timber-line meadows. – Blue River: 40 (13967) wet mesotrophic fen. – VK: Aleza Lake.

S. leres (Schimp.) Ångstr. – WGP: Murtle Lake 20 (13201b, 13202, 13204, 13505) meso-eutrophic alluvial and eutrophic fens, 30 (13466b) wet mesotrophic fen. – Blue River: 40 (13909) by brook in mesotrophic fen.

S. warnstorffii Russow (CSA: *S. warnstorffianum*) – WGP: Murtle Lake 20 (13240, 13297, 13301, 13504) abundant in meso-eutrophic to eutrophic fens, 30 (13441) mesotrophic fen; Stevens Lakes 31 (14768) lake shore bank; Battle Mtn. 37 (14086) mesotrophic fen. – VK: Blue River.

S. wulfianum Girg. – VK: Aleza Lake.

Andreaeaceae

Andreaea rupestris Hedw. – WGP: Murtle Lake 25 (14684) boulder bed near lake shore.

Fissidentaceae

Fissidens adianthoides Hedw. – WGP: Murtle Lake 20 (13727) boulder on river shore, 22 (13419) alluvial lake shore.

F. osmundoides Hedw. – WGP: Azure Lake 18 (14080) wet rocks by waterfalls.

Ditrichaceae

Ditrichum flexicaule (Schwaegr.) Hampe – WGP road: 12 (14981) wet calcareous soil. – WGP: Azure Lake 18 (14082) wet rocks; Murtle Lake 25 (13523a) sparsely in slightly calcareous boulder bed.

Ceratodon purpureus (Hedw.) Brid. – Tulameen: 10 (10451) arid forest ground. – WGP road: 12 (13022, 13114, 13131, 13837, 13842) on rotting wood in farmyard, dry pasture, bare roadsides, calcareous rock outcrop, and soil in seral *Populus tremuloides* forests (cf. HÄMET-ÄHTI 1965 b, p. 282), common. – WGP: Hemp Creek 13 (7366a) old site of camp fire; Murtle Lake 20 (14998) bare humus by hunting cabin; Battle Mtn. 37 (14212) timber-line meadow.

Distichium capillaceum (Hedw.) B.S.G. – WGP: Murtle River 14 (13157) moist cliff; Azure Lake 18 (14019a) wet rocks by waterfalls; Murtle Lake 20 (13732) stone in rapids; Battle Mtn. 42 (14748) sparsely in alpine boulder bed.

Seligeraceae

Blindia acuta (Hedw.) B.S.G. – WGP: Murtle Lake 27 (13490) wet, mossy rock outcrop on lake shore.

Dicranaceae

Dicranella heteromalla (Hedw.) Schimp. – WGP: Murtle Lake 20 (13763) bare, wet mineral soil in dense forest.

D. palustris (Dicks.) Crundw. (*D. squarrosa* (Starke) Schimp.) – WGP: Battle Mtn. 35 (14153), 37 (14142), 39 (14265). – Blue River: 40 (13929). – Common along cold brooks, often spring-fed, in timber-line meadows.

Campylopus atrovirens De Not. – VK: Prince Rupert.

Paraleucobryum enerue (Thed. ex C. J. Hartm.) Loeske – WGP: Battle Mtn. 35 (14163) lava rocks along a brook, 41 (14306) alpine rock crevices. – VK: Prince Rupert.

P. longifolium (Hedw.) Loeske – WGP: Murtle Lake 25 (7320, 13551) boulder bed near lake shore, abundant.

Amphidium lapponicum (Hedw.) Schimp. – WGP: Azure Lake 17 (14039) acid cliff on lake shore; Murtle Lake 25 (7324, 13165) boulder bed near lake shore.

A. mougeotii (B.S.G.) Schimp. – WGP: Murtle River 14 (13149) shaded lava cliff.

Dichodontium pellucidum (Hedw.) Schimp. – WGP: Murtle Lake 20 (13725, 13742) rocky river shore and wet boulder in rapids. – VK: Aleza Lake.

Dicranoweisia cirrata (Hedw.) Lindb. – Vancouver Island: 1 (15202) on rotten log in dense coastal forest, 7 (15235) on lower branches of pear tree in garden. – ECM: Victoria, on logs, 1931.

D. crispula (Hedw.) Lindb. – Tulameen: 10 (10377) on shaded cliffs of creek gorge. – WGP: Murtle Lake 20 (13338, 13341) on small stones on and near lake shore, 26 (13251) on shaded boulders along a brook; Battle Mtn. 35 (14171) lava rock outcrop along a brook in mountain meadow, 41 (14281, 14296, 14742) in rock crevices and rocky grass-heap.

Oncophorus virens (Hedw.) Brid. – WGP: Azure Lake 18 (14085) wet rocks by waterfalls; Murtle Lake 26 (13252) abundant in spring-fed brook.

Kiueria starkei (Web. & Mohr) I. Hag. – WGP: Battle Mtn. 35 (14159) along brook in timber-line meadow, 37 (14224, 14862, 14882, 14899) common in dry meadows with *Antennaria lanata*, *Vaccinium caespitosum* and *Carex nigricans* as dominants, 42 (14317) snow-bed.

The specimens were referred to this species rather than to *K. blyttii* (Schimp.) Broth. mainly because the androecia are located close below the perichaetia. However, the leaves are slightly papillate rather than quite smooth.

Dicranum angustum Lindb. – WGP: Stevens Lakes 31 (14767) shore bank of lake with *Sphagnum warnstorffii*.

D. bonjeanii De Not. – VK: Field.

D. fuscescens Turn. – Vancouver Island: 1 (15152) wood; 2 (15282, 15307) rocks and stony ground in open *Pseudotsuga* – *Gaultheria shallon* forest. – Tulameen: 10 (10321) wood, 10 (10409) on base of conifer, arid woodland. – Manning Park: 11 (15403) boulder. – WGP road: 12 (13014) wood. – WGP: Hemp Creek 13 (7365) wood and sparsely on forest floor mixed with rotten wood in *Thuja* forest; Murtle River 15 (13848) wood; Murtle Lake 20 (13314, 13399, 13767) wood and sparsely on forest floor in mesic *Abies* – *Picea* forest on lake shore, 21 (13779, 13795) wood and alluvial sandy lake shore, 22 (13351, 13395) wood, 27 (13486, 13495) rocks; Battle Mtn. 35 (14773) timber-line meadows and forests, 41 (14288) rocks and rocky soil. – VK: Cowichan Lake; Golden; Longworth; Six Mile Lake; Hazelton; Dorreen.

The bulk of the material clearly belongs to var. *congestum* (Brid.) Husn. However, some specimens (Golden, Dorreen) are referable to var. *flexicaule* (Brid.) Wils., which is often regarded as synonymous with var. *fuscescens*. In the WGP area *D. fuscescens* is almost restricted to rotten wood below the orohemiarctic zone. In and above this zone it is also present on soil but because of confusion with *D. pallidisetum*

(see under that species) the field notes on frequency are unreliable.

D. howellii Ren. & Card. (CSA: not recognized) – Vancouver Island: 1 (15144, 15203, 15209) common on rotting logs, 2 (15274, 15280, 15300, 15305) rocks and stony ground in open *Pseudotsuga* – *Gaultheria shallon* forest, 6 (14922) rocks.

This species has not been recently recognized except by IRELAND (1965 a). However, in our opinion it is quite distinct and apparently common right on the coast. In herbaria it has been variously included in *D. majus*, *D. scoparium* or *D. bonjeanii*. The narrow, relatively long and almost entire leaves, besides the gradually tapering perichaetial leaves (unlike those of *D. majus* etc.), serve to distinguish it from allied species.

D. leioneuron Kindb. (CSA: incl. in *D. scoparium*) – Queen Charlotte Islands: collected in oligotrophic bogs by Professor HUGO SJÖRS (Uppsala, Sweden) in 1966 (conf. T. AHTI and P. ISOVITTA).

New to the west coast of North America. Earlier, this species has been recorded for a number of localities in eastern Canada and northwestern Europe (AHTI & ISOVITTA 1962, AHTI, ISOVITTA & MAASS 1965). Recently we have confirmed the existence of this species in N.W. Germany: at least most of the records of *D. bonjeanii* discussed by MÜLLER (1965, p. 47) belong here (specimens in H). Another new record comes from the Kaliningrad District (formerly East Prussia): 'Kreis Labiau', raised bog, 1930 F. & K. Koppe (H; kindly sent by Dr. K. KOPPE). It may be also present in the Netherlands (see BARKMAN & VAN ZANTEN 1967, pp. 67 – 68).

[*D. majus* Turn. – Reported from Prince Rupert by KIJALA (1945, p. 357) but no specimens seen. Correctly identified specimens of this species from western Canada are not common (none found in UBC in 1961). At least some literature records are based on *D. howellii*. *D. majus* is hardly common anywhere in B.C. However, it is found in Alaska (e.g. PERSSON & GJAEREVOLL 1957, p. 34, 1961, p. 14).]

D. muehlenbeckii B.S.G. – WGP: Battle Mtn. 37 (14900) common at margins of forests in *Luetkea pectinata* – *Lycopodium sitchense* heaths and sparsely in some meadow communities. – VK: Field; Kamloops; Vanderhoof.

The specimens belong to var. *cirratum* (Schimp.) Lindb. (var. *brevisfolium* Lindb.), if it is distinguishable from var. *muehlenbeckii*.

D. pallidisetum (Bailey) Irel. – WGP: Battle Mtn. 35 (14243), 37 timber-line forests. – Blue River: 40 (13957, 13977, 13978) timber-line forests and meadows. – VK: Longworth. – The WGP specimens were kindly confirmed by Dr. R. R. IRELAND.

This species was only recently properly described by IRELAND (1965 b). It is not very easy to characterize and identify by habit only, but it seems to deserve specific rank. This is confirmed by the fact that in the field in WGP this species puzzled the collectors in connexion with the phytosociological analyses, and it was referred to *D. fuscescens* (HÄMET-AHTI 1965 b, Table 3) only with hesitation. In the fairly dry, open stands of *Abies lasiocarpa* and *Picea engelmannii* at the timber-line it is frequently a dominant moss, forming mats ca. 7 – 8 cm thick, often very solid and pure (op. cit., as *D. fuscescens* in Fig. 10 and sample plot 53, which is not very representative, however). Associated bryophytes include *Dicranum scoparium*, *Pohlia nutans*, *Barbilophozia lycopodioides* and *Orthocaulis floerkei*. It is also present, although sparse, in some mountain meadow communities.

D. polysetum Sw. (*D. undulatum* auct.) – WGP road: 12

(13126). – WGP: Hemp Creek 13 (14813); Murtle River 14, 15 (13868); Murtle Lake 23. – Blue River: 19. – Upper North Thompson River Valley: between Vavenby and McMurphy (15009), *Pinus contorta* forest on highway, abundant. – VK: Kamloops.

Fairly common in dry pine, aspen and hemlock forests on ground and on stumps. As pointed out by HÄMET-AHTI (1965 b, p. 286), who recorded this species (as *D. undulatum*) in 10 sample plots, *D. polysetum* is not generally found in mesic forests in Wells Gray Park, in contrast to northern Europe. It was also searched for in vain above the middle oroboreal zone.

D. scoparium Hedw. – Manning Park: 11 (15401). – Tulameen: 10 (10278). – WGP: Hemp Creek 13; Azure Lake 17; Murtle Lake 20, 22 (13412, 13429), 23, 25 (13720), 26 (13281, 13287, 13293), 29; Battle Mtn. 35 (14896), 37 (14176, 14225, 14227, 14791, 14799, 14867, 14870, 14904, 14908). – Blue River: 19, 34 (13959), 40 (13894). – Upper North Thompson River valley: Messiter, Porte d'Enfer Canyon (15003). – VK: Field. – A very common species in the area in the moss floor of forests and mountain meadows as well as rock outcrops, rotting logs and shore banks. In the forests most abundant in the timber-line stands (HÄMET-AHTI 1965 b).

D. spadiceum Zett. – WGP: Battle Mtn. 42 (14322) rocky grass-heath.

D. undulatum Brid., non auct. plur. (*D. bergeri* Bland.) – WGP: Hemp Creek 13 (14001) *Sphagnum fuscum* hummock in eutrophic fen, abundant; Stevens Lakes 32 (15046) bog forest. – Blue River: 40 (13990) hummock in timber-line fen, sparsely. – Not common on peatlands.

Orthodicranum montanum (Hedw.) Loeske (CSA: *Dicranum montanum*) – WGP: Murtle Lake 24 (13605) shaded boulder; Battle Mtn. 37 (14861) mountain meadow. – Blue River: 34 (13913) boulder in forest, uncertain. – VK: between Blue River and Valemount, on *Thuja plicata*; Longworth, on *Thuja plicata*.

O. strictum (Schleich.) Culm. (CSA: *Dicranum tauricum*) – Vancouver Island: 1 (15207, 15211). – Tulameen: 10 (10324). – WGP road: 12 (13013). – WGP: Murtle Lake 22 (13352, 13396). – VK: Aleza Lake. – All on rotting wood in various forests.

The determination is somewhat uncertain. The material (all sterile) looks rather homogeneous but as if intermediate between *O. strictum* and *Dicranum fragilifolium* Lindb. However, it comes closer to the former species because of the narrow nerve, which has no stereids in the basal third, and of the sparsely porose leaf-cells, which are only slightly collenchymatous in the upper part of the leaf. In North European material of *O. strictum* the cell walls are still thinner. It is noteworthy that this species has been reported from several localities in interior Canada (BURD 1966, p. 15), while in Europe its distribution shows clearly oceanic features.

Leucobryaceae

Leucobryum glaucum (Hedw.) Ångstr. – VK: Longworth, at the foot of *Picea engelmannii*.

Encalyptaceae

Encalypta ciliata Hedw. – WGP: Murtle Lake 25 (13688, 13709) calcareous rocks.

E. rhabdocarpa Schwaegr. – WGP: Murtle River 14 (13158) moist cliff.

Pottiaceae

Anoetangium aestivum (Hedw.) Mitt. – WGP: Azure Lake 18 (14011) on wet calcareous rocks by the falls, abundant.

This species has very rarely been collected in North

America and is apparently not known from central (cf. BIRD 1966) or eastern Canada. Recently, LAWTON & IRELAND (1963) reported it from British Columbia and Washington.

Tortella fragilis (Hook. ex Drum.) Limpr. – WGP: Murtle Lake 20 (13743) wet boulder in rapids, 25 (13523) calcareous rock.

T. tortuosa (Hedw.) Limpr. – WGP: Murtle Lake 20 (13730) moist hummock on river bank (!), 25 (13710) calcareous rock. – VK: Field.

Barbula convoluta Hedw. – WGP road: 12 (13090) spring-fed calcareous soil in old burn by road.

B. cylindrica (Tayl. ex Mack.) Schimp. ex Boul. – Vancouver Island: 7 (14969) on soil in garden. – WGP: Murtle River 14 (13168) lava rocks.

The specimens have leaves that are longer and somewhat more papillate than those of typical *B. vinalis* Brid. and therefore they probably belong to *B. cylindrica* (cf. STEBER 1939), which could also be treated as a variety.

B. fallax Hedw. – WGP road: 12 (13091) spring-fed calcareous soil in old burn by road.

B. unguiculata Hedw. – WGP road: 12 (13796a, 14977) road cutting and dry pasture.

Desmatodon latifolius (Hedw.) Brid. – WGP: 35 (14857) mountain meadow.

Tortula norvegica (Web.) Wahlenb. ex Lindb. – VK: Field alpine zone, dominant moss in *Empetrum* – *Phyllodoce* community.

T. princeps De Not. – Vancouver Island: 8 (15105) on *Quercus garryana* in old pasture.

T. ruraliformis (Besch.) Dix. – WGP road: 12 (13109) calcareous rock in old burnt area.

T. ruralis (Hedw.) Gaertn., Meyer & Schreb. – Tulameen: 10 (10389, 10576) on rocks. – Manning Park: 11 (15442) calcareous cliff. – WGP: Murtle Lake 25 (13512, 13539) calcareous rocks; Battle Mtn. 37 (14834) timber-line meadow. – VK: Victoria, stone; Kamloops, «prairie». – ECM: Victoria, 1930.

Grimmiaceae

Scouleria aquatica Hook. – WGP road: 12 (13004) on stones in rapids of Hemp Creek. – WGP: Murtle Lake 20 (13745) on wet boulder in rapids.

Grimmia anodon B.S.G. – VK: Kamloops, on stones by a creek.

G. mollis B.S.G. – WGP: Battle Mtn. 42 (14318) in brook by snow-bed.

G. ovalis (Hedw.) Lindb. – WGP: Murtle Lake 25 (13520) boulder bed near lake shore.

G. patens (Hedw.) B.S.G. (CSA: *Racomitrium patens*) – Blue River: 40 (13954) sparsely in moist timber-line meadow, with *Racomitrium canescens* var. *ericoides*.

G. sessitana De Not. var. *subsulcata* (Limpr.) Breidl. (CSA: incl. in *G. alpestris*) – WGP: Battle Mtn. 37 (14192, 14211) on stones in dry timber-line meadows, 41 (14743) alpine rocks.

G. torquata Hornsch. ex Grev. – Tulameen: 10 (10392) shady cliff in creek gorge.

G. trichophylla Grev. var. *tenuis* (Wahlenb.) Wijk & Marg. (*G. muelhenbeckii* Schimp.) – Vancouver Island: 5 (14949) calcareous rocks.

Schistidium agassizii Sull. & Lesq. (CSA: *Grimmia agassizii*) – WGP: Murtle Lake 20 (13733) boulder in rapids.

S. alpicola (Hedw.) Limpr. (CSA: *Grimmia alpicola*) – WGP road: 12 (13002) stones in Hemp Creek. – WGP: Murtle Lake 20 (13730, 13734) on wet boulders in rapids.

S. apocarpum (Hedw.) B.S.G. (CSA: *Grimmia apocarpa*)

var. *apocarpum* – Manning Park: 11 (15441) calcareous cliff. – VK: Field, subalpine zone.

var. *atrofuscum* (Schimp.) C. Jens. ex Weim. – WGP road: 12 (13880, 13881) on boulders in open pasture.

cf. var. *ambiguum* (Sull.) – WGP road: 12 (13879) boulder in open pasture.

S. maritimum (Turn.) B.S.G. (CSA: *Grimmia maritima*) – Vancouver Island: 8 (15059) rocks on seashore.

S. strictum (Turn.) Loeske ex O. Mårt. (CSA: *Grimmia apocarpa* var. *stricta*; *Grimmia apocarpa* ssp. *papillosa* (Calm.) Poelt) – WGP road: 12 (13003, 13095, 13878) stones in Hemp Creek, calcareous rock outcrop and boulders in open pasture. – WGP: Murtle Lake 25 (13680) boulder bed.

Racomitrium aciculare (Hedw.) Brid. – WGP: Murtle Lake 20 (13735) wet boulder in rapids.

R. canescens (Hedw.) Brid. var. *ericoides* (Brid.) B.S.G. – Vancouver Island: 2 (15335, 15339) open rocks by the falls, 6 (14952) calcareous rocks, 8 (15115) rocky meadow on seashore. – Manning Park: 11 (15408, 15428) on recently burnt ground and on rocks. – WGP road: 12 (13110) calcareous rocks in aspen forest. – WGP: Azure Lake 17 (14055) open rock outcrop in forest; Battle Mtn. 37 (14196, 14897) stones along a brook and dry *Antennaria* community in mountain meadows. – Blue River: 40 (13903, 13940) on thin soil on low rock outcrop in mountain meadow and deep soil in *Phyllodoce empetriformis* heath, fairly common. – VK: Victoria.

In northern Europe var. *canescens* and var. *ericoides* seem to be readily distinguishable on the basis of morphology, ecology and distribution. However, it is uncertain whether var. *ericoides* of B.C. is fully identical with the N. European type. In the present paper all specimens possessing numerous short branchlets have been included in var. *ericoides*. In the N. European var. *ericoides* the dorsal mamillae are generally lower and more rounded than in var. *canescens*, but, for instance, no. 13110 in the present material has both high mamillae (up to 10 μ) and short branchlets in the same individuals.

R. fasciculare (Hedw.) Brid. – WGP: Battle Mtn. 37 (15050) spring-fed creek.

R. heterostichum (Hedw.) Brid. – ECM: Victoria 1931.

R. lanuginosum (Hedw.) Brid. – Vancouver Island: 6 (14019, 14938), 8 (15058, 15082) on rocks.

R. microcarpon (Hedw.) Brid. (CSA: *R. heterostichum* var. *microcarpon*) – Vancouver Island: 2 (15338) rock outcrop by the falls, 8 (15083) rocky meadow on seashore. – WGP: Azure Lake 17 (14045) rock outcrop in forest; Murtle Lake 20 (13337) stone on lake shore, 25 (7316, 7321) abundant in boulder bed; Battle Mtn. 41 (14732) rocky alpine soil. – Upper North Thompson River valley: Messiter, Porte d'Enfer Canyon (14999) rocks by the waterfalls.

R. sudeticum (Funck) B.S.G. (CSA: *R. heterostichum* var. *sudeticum*) – WGP: Murtle Lake 20 (13334) stone on lake shore; Battle Mtn. 35 (14165) lava rocks, 37 (14193, 14230, 14234) common on stones in mountain meadow, 41 (14319) alpine rocks. – Blue River: 40 (13953) wet soil in mountain meadow. – ECM: Victoria.

The nos. 14165, 14230, 14234 and the Victoria specimen are somewhat uncertain, approaching the type called *R. heterostichum* var. *affine* (Schleich.) Corb. As noted by SCHOFFIELD (1965, p. 30), the whole *R. heterostichum* complex in British Columbia is in need of taxonomic revision.

R. varium (Mitt.) Lesq. & James – ECM: near Victoria.

Funariaceae

Funaria hygrometrica Hedw. – WGP road: 13 (14978)

road cutting. — WGP: Hemp Creek 12 (7366) site of campfire. — ECM: Victoria, 1931.

Splachnaceae

Tayloria lingulata (Dicks.) Lindb. — WGP: Murtle Lake 27 (13493) rock on lake; Battle Mtn. 35 (14155) bank of brook.

Tetraplodon angustatus (Hedw.) B.S.G. — VK: Six Mile Lake.

Splachnum ampullaceum Hedw. — VK: Six Mile Lake.
S. ovatum Hedw. — Blue River: 19 (13939). — WGP: Stevens Lakes 33 (15049). — VK: Six Mile Lake. — On animal excrement in forests.

Schistostegaceae

Schistostega pennata (Hedw.) Hook. & Tayl. — VK: Aleza Lake, on bare mull at the foot of a fallen spruce.

Tetraphidaceae

Tetraphis pellucida Hedw. — Vancouver Island: 1 (15200). — WGP: Hemp Creek 13 (7394); Murtle River 15 (13866); Murtle Lake 25 (13713). — On rotting wood in shady forests.

Bryaceae

Pohlia cruda (Hedw.) Lindb. — WGP: Murtle Lake 25 (13508, 13712) boulder bed. — VK: Blue River, at foot of trees in moist forest; Aleza Lake, rock.

P. nutans (Hedw.) Lindb. — Vancouver Island: 2 (15341) rocks. — Manning Park: 11 (15413) forest humus. — WGP road: 12 (13040) rotten wood. — WGP: Azure Lake 17 (14042) rocks; Murtle Lake 21 (13794) swamp forest, 25 (13515) boulder bed, 29 (13451) earth mound on sandy shore; Battle Mtn. 37 (14772, 14884) forest floor and meadows, 39 (14251) among *Sphagnum fuscum* by a brook, 41 (14279) alpine grass-heath. — Blue River: 19, forest floor.

P. wahlenbergii (Web. & Mohr) Andr. (*P. albicans* (Wahlenb.) Lindb.) — WGP: Murtle River 14 (13154) abundant on wet cliff; Battle Mtn. 37 (14219) along a brook in mountain meadow, 39 (14111a) spring.

Leptobryum pyriforme (Hedw.) Wils. — WGP road: 12 (13001, 14808) bare calcareous soil in seral aspen forest. — WGP: Hemp Creek 13 (7367) bare soil on trail; Clearwater Lake 16 (7361) bare soil on lake shore. — VK: Kamloops; Blue River.

Bryum argenteum Hedw. — WGP road: 12 (14976) road-cut, fert.

B. caespititium Hedw. — WGP road: 12 (13131b) on ground in seral *Populus* forest, with *Ceratodon purpureus*.

B. capillare Hedw. — Vancouver Island: 1 (15182) bare soil by trail in forest. — WGP: Murtle River 14 (13147) cliff crevices; Murtle Lake 25 (7329) boulder bed; Battle Mtn. 41 (14201) rocky soil.

B. cf. cirrhatum Hornsch. (CSA: *B. lonchocaulon*) — WGP road: 12 (13090b) spring-fed, calcareous mineral soil.

Clearly synoecious and spores up to 20 μ in diam.

B. cf. pseudotriquetrum (Hedw.) Gaertn., Meyer & Schreb. — WGP: Battle Mtn. 39 (14112, 14113) in spring and brook at timber-line, with *Dicranella palustris*, *Philonotis tomentella*, and *Pohlia wahlenbergii*.

B. weigelii Spreng. (*B. dualityi* Voit) — WGP: Battle Mtn. 37 (13604) wet *Carex nigricans* meadows. — VK: Blue River; Aleza Lake, forest of 'fern type'.

Roellia roellii (Broth.) Crum (CSA: *Bryum sandbergii*) — WGP: Battle Mtn. 35 (14226, 14781), 37, 3 mi. SW of Fight Lake. — Blue River: 40 (13908). — This conspicuous *Mnium*-like species is one of the dominant bryophytes in the timberline forests, often covering 20 to 50 per cent of the forest

floor in mesic *Abies lasiocarpa* — *Picea engelmannii* stands (cf. HÄMET-AHTI 1965 b). It is also common in some timberline meadow types, e.g. in the *Valeriana sitchensis* meadows bordering the forest stands.

[*Rhodobryum roseum* (Hedw.) Limpr. — Reported by KUJALA (1945, p. 258) from Longworth but no specimens seen. According to R. TUOMIKOSKI (verbal comm.) at least the eastern N. American representative of this genus is not *R. roseum* but a distinct species, *R. ontariense* Kindb.]

Mniaceae

Leucolepis menziesii (Hook.) Steere — Vancouver Island: 1 (15183), 2 (15299). — VK: Victoria; Cowichan Lake; Vancouver, Stanley Park; Prince Rupert.

Mnium ciliare (C. Müll.) Schimp. (CSA: incl. in *M. affine*) — VK: Longworth, moist forest, among *M. drummondii*.

Mr. TIMO KOPONEN (Helsinki), who identified the specimen, is conducting an extensive study on the genus. He uses the name *M. ciliare* to mean a widespread but poorly known, essentially eastern North American member of the *M. affine* group (excl. *M. rugicum* and *M. medium*), which seems to be absent in Eurasia (cf. KOPONEN 1967). Earlier, TUOMIKOSKI (1936, p. 36) pointed out that many of the American specimens of *M. 'affine'* are not quite identical with the European ones (cf. also PERSSON & GJÆREVOLL 1957, p. 55). KUJALA (1945, p. 430) published the cited specimen as *M. affine*. See also under *M. drummondii*.

M. cinclidioides Hüb. — WGP: Murtle Lake 20 (13300a) meso-eutrophic fen. — VK: Aleza Lake, by creek.

M. drummondii Bruch & Schimp. — WGP: Hemp Creek 13 (14103, 14795) mesic forest floor. — VK: Blue River, forest floor; between Blue River and Valemount, forest floor; Longworth, moist ground; Aleza Lake; Six Mile Lake. — Part of no. 14103 was at first referred to *M. affine* by us and erroneously published as such by HÄMET-AHTI (1965 b, p. 284).

M. glabrescens Kindb. — Vancouver Island: 1 (15210). — Vancouver: 5 (15026). — VK: Cowichan Lake; Vancouver, Stanley Park; Terrace; Prince Rupert. — YI: Vancouver, Stanley Park. — Common on rotten logs and in forest floor in the coastal forests.

M. insigne Mitt. — Vancouver Island: 1 (15185) forest floor. — VK: Langford; Cowichan Lake; Blue River; Longworth; Aleza Lake; Terrace; forest floor, sometimes dominant. — ECM: Victoria, 1931. — YI: Vancouver, Stanley Park.

M. lycopodioides Schwaegr. — WGP: Murtle Lake 25 (13510) shady boulder bed near lake shore.

M. marginatum (With.) Brid. ex P. Beauv. — WGP: Hemp Creek 13 (7395) spring-fed brook in dense *Thuja* forest. — VK: Longworth, rock.

M. medium B.S.G. (conf. Timo Koponen) — WGP road: 12 (7400, 13088) bare calcareous soil in seral aspen forest and along Hemp Creek. — WGP: Murtle Lake 20 (13312, 13761) swamp forests, 22 (13377) mesic forest floor, 30 (13460) moist forest. — VK: between Victoria and Cowichan Lake; Longworth; Aleza Lake; Six Mile Lake; forest floor and rocks.

M. nudum Williams — WGP: Murtle Lake 20 (14816, 14826), 22 (13343), 30 (13463); Battle Mtn. 35 (14783). — VK: between Victoria and Cowichan Lake; Blue River; Longworth. — In mesic to wet forest floor, often common.

M. orthorrhynchum Brid. — WGP: Azure Lake 18 (14020) wet rocks by waterfalls; Murtle Lake 24 (13669) big erratic block, 25 (13687) calcareous boulder bed; Battle Mtn. 41 (14294) alpine rock crevices.

M. cf. pseudopunctatum Bruch & Schimp. — WGP: Hemp Creek 13 (7385) by brook; Murtle River, 3 mi. SW of Murtle Lake (13179) spring-fed brook; Murtle Lake 20 (13230)

swamp forest; Stevens Lakes 33 (15048) moist spruce forest; Battle Mtn. 37 (14218) along a brook in mountain meadow, 39 (14261) wet rock outcrops. — VK: Blue River; Longworth; Aleza Lake; Six Mile Lake; Dorreen.

M. pseudopunctatum is generally regarded as autoecious but no autoecious shoots were found in the present material, despite a careful search. However, we do not think that these specimens belong to *M. punctatum*, since the leaf characters are as in *M. pseudopunctatum*. In addition, the two specimens (no. 7385 and Six Mile Lake, plot 65, coll. Kujala) that have sporophytes possess capsules which are relatively small and rounded. The spores are 40 μ or more in diameter and the outer peristome is finely papillose below and coarsely papillose-striate above. All these characters belong to *M. pseudopunctatum* (e.g. NYHOLM 1958, p. 267).

M. punctatum Hedw. — WGP: Azure Lake 18 (14081) wet rocks by waterfalls; Murtle Lake 20 (13751) wet forest. — Blue River: 40 (13910) wet forest along a brook.

These specimens are clearly dioecious, with differentiated male and female stems. Also the leaf characters fit this species. No. 13751 is referable to var. *elatum* Schimp.

M. rostratum Schrad. (det. Timo Koponen) — VK: Longworth, *Oplopanax* — *Thuja plicata* forest.

M. rugicum Laur. (CSA: incl. in *M. affine*) — WGP: Murtle Lake 20 (13300) meso-eutrophic fen. — VK: Blue River, moist forest; Six Mile Lake.

M. spinulosum B.S.G. — Manning Park: 11 (15418) on ground in dry *Pinus contorta* forest. — WGP: Hemp Creek 13 forest floor; Clearwater Lake 16 (7354) rotten wood; Murtle Lake 20 forest floor, 22 (13344, 13404, 13427) forest floor and rotten wood, 25 (13711) boulder bed. — A fairly common species in mesic forest in the Wells Gray Park area (HÄMERÄHTI 1965 b). — VK: Victoria — Cowichan Lake; Blue River; Blue River — Valemount; Longworth; Six Mile Lake.

M. venustum Mitt. — Vancouver Island: 1 (15151) forest floor. — VK: Langford.

Aulacomniaceae

Aulacomnium androgynum (Hedw.) Schwaegr. — Vancouver Island: 1 (15214) log, fert. — Manning Park: 11 (15443) cliff. — WGP: Clearwater Lake 16 (7354) rotten wood and bare soil; Azure Lake 17 (14043) cliff; Murtle Lake 25 (13585) rotten wood. — VK: Cowichan Lake, fert.

A. palustre (Hedw.) Schwaegr. — Vancouver Island: 2 (15333) rocks. — WGP road: 12 (13081). — WGP: Murtle Lake 25 (13392) small sandy island opposite to Ramsay Mtn., 26 (13283); Battle Mtn. 35 (14239), 37 (14140, 14207, 14221), 39. — Blue River: 34, 40. — VK: Capilano; Field; Prince Rupert. — In WGP fairly common, on river banks, lake shores, rotten wood in wet forests and particularly in the timber-line meadows, where it is most abundant in communities termed *Caltha leptosepala* — *Trollius albilorus*, *Agoseris aurantiaca* — *Carex nigricans*, *Carex nigricans*, and *Calamagrostis canadensis* types.

Meesiaceae

Meesia trifaria Crum, Steere & Anderson (*Meesia triquetra* (Hook. & Tayl.) Ångstr.) — WGP: Murtle Lake 20 (13298) spring-fed fen, sparsely.

M. uliginosa Hedw. — WGP: Azure Lake 18 (14082b) among *Orthothecium chryseum* on wet cliff by waterfalls.

Bartramiaceae

Plagiopus oederi (Sw.) Limpr. (CSA: *P. oederiana*) — WGP: Murtle River 14 (13156, 13167) wet cliff and dry lava rocks; Azure Lake 18 (13519) wet cliff.

Anacolia menziesii (Turn.) Par. — VK: Cowichan Lake, rock. — ECM: Victoria, rocks, 1930.

The specimens represent the type with very long leaves that was called *A. aristifolia* Grout by GROUT (1935, p. 156).

Bartramia pomiformis Hedw. — Vancouver Island: 2, moist rocks. — WGP: Azure Lake 14 (14029) cliff on lake shore. — VK: Cowichan Lake, on *Acer*.

The specimens belong to var. *elongata* Turn. (var. *crispa*), if this deserves recognition.

Conostomum tetragonum (Hedw.) Lindb. — WGP: Battle Mtn. 37 (14124, 14188) bare peaty humus on hummocks in timberline meadow, sparsely, 42 (14335) abundant in snow-bed.

Philonotis fontana (Hedw.) Brid. — VK: Dorreen.

P. tomentella Mol. (CSA: *P. fontana* var. *pumila*) — WGP: Murtle Lake 20 (13305) meso-eutrophic fen; Battle Mtn. 39 (14111, 14245, 14254) in spring water. — VK: Field, subalpine zone.

Timmiaceae

Timmia austriaca Hedw. — Tulameen: 10 (10379) cliffs of creek gorge. — WGP: Murtle Lake 22 (13367) on litter in mesic forest, 29 (13446) mesic forest floor. — VK: Golden, forest floor; Field, hillside forest; Longworth, hillside forest; Six Mile Lake, by creek.

Orthotrichaceae

Zygodon rupestris (C. Hartm.) Milde (CSA: *Z. viridissimus* var. *rupestris*; *Z. 'vulgaris'* (Malta) Nyholm) — Vancouver Island: 4 (15367) on bases of tree-trunks, 9 (15042) on *Acer* in park.

The combination *Zygodon vulgaris* was published by NYHOLM (1960, p. 313) without a page reference to the basionym and is thus invalid. In addition, the basionym *Zygodon viridissimus* ssp. *eu-viridissimus* var. *vulgaris* Malta is a superfluous name for *Z. viridissimus* var. *rupestris* Lindb. ex C. Hartm., which was included in this taxon by MALTA.

Orthotrichum alpestre Hornsch. ex B.S.G. — WGP: Murtle River 14 (13148) crevices of shaded lava cliff.

O. consimile Mitt. — Vancouver Island: 7 (15234) twig of pear tree in garden.

O. lyellii Hook. & Tayl. — Vancouver Island: 1 (15168) tree trunks; 9 (15208) on *Quercus* in the Government House Park. — ECM: Victoria, 1930.

The last-mentioned specimen is referable to var. *papillosum* (Hampe) Lesq. & James.

O. rupestre Schleich, ex Schwaegr. — WGP: Murtle Lake 24 (13666) big boulder in forest; 25 (13608, 13685) boulder bed.

O. speciosum Nees ex Sturm — Vancouver Island: 8 (15111) on *Quercus garryana*. — WGP: Murtle River 15 (13855) lower twigs of *Tsuga heterophylla* in the spray zone of Helmcken Falls.

O. striatum Hedw. — Vancouver Island: 1 (15173) on a tree. *Stroemia obtusifolia* (Brid.) I. Hag. (CSA: *Orthotrichum obtusifolium*) — WGP: Murtle Lake 25 (13593) on *Salix* tree.

Uloa curvifolia (Wahlenb.) Brid. — WGP: Murtle Lake 25 (7314, 13693) boulder bed near lake shore.

Fontinalaceae

Fontinalis antipyretica Hedw. — WGP: Battle Mtn. 37 (14874, 14875) brook in mountain meadow. — ECM: Victoria, brackish water, towards mouth of river.

F. neomexicana Sull. & Lesq. — WGP road: 12 (13023) on stones in rapids of Hemp Creek. — VK: Aleza Lake, in creek.



Fig. 3. A stand of *Tsuga heterophylla* and *Thuja plicata* sprayed by mist from the Rainbow Falls, Angus Horne Creek, Azure Lake (locality no. 18). The twigs bear thick covers of *Antitrichia curtispindula* var. *gigantea*, with some *Neckera pennata*.

Climaciaceae

Climacium dendroides (Hedw.) Web. & Mohr – WGP: Murtle Lake 26 (13282) abundant on moist river bank; Battle Mtn. 37 (14794) timber-line *Antennaria* meadow, sparsely. – VK: Six Mile Lake.

Pleuroziopsis ruthenica (Weinm.) Kindb. ex Britt. – VK: between Victoria and Cowichan Lake.

This record, based on abundant material, confirms the old data on the existence of this species on Vancouver Island, which was doubted by SCHOFIELD (1965, p. 33 and Map 1).

Hedwigiaceae

Hedwigia ciliata (Hedw.) P. Beauv. – Vancouver Island: 8 (15067) rocks on seashore. – WGP: Murtle River 14 (13153) dry lava cliff; Murtle Lake 25 (13606, 13627) boulder bed near lake shore. – Not very frequent.

Particularly nos. 13153 and 13627 are very slender and sparsely branched and their leaves have broad hyaline points. To the collectors their appearance was peculiar when compared to the N. European material. Among the forms recognized by GROUT (1933, p. 46), the most suitable for their inclusion would be 'I. *leucophaea* (B.S.G.) Grout'.

Pseudobraunia californica (Lesq.) Broth. – ECM: Victoria, Highland District, 1931.

Cryphaeaceae

Asia californica (Hook. & Arnott) Sull. – ECM: Victoria, 1930.

Dendroalsia abietina (Hook.) Britt. – VK: Langford, on trees in moist forest.

Leucodontaceae

Antitrichia californica Sull. ex Lesq. – Vancouver Island: 1 (15158) tree trunk. – VK: Victoria, tree trunk.

A. curtispindula (Hedw.) Brid. – Vancouver Island: 1 (15196) rotten log in dense forest, abundant. – WGP: Azure Lake 18 (14016, 14070) extremely abundant on twigs of *Tsuga heterophylla* (Fig. 3) sprayed with mist from Rainbow Falls, also on wet rocks by the falls. – VK: Cowichan Lake; Vancouver, Stanley Park, on *Acer circinatum*; Dorreen.

The specimens seem to belong to var. *gigantea* Sull. & Lesq., which may be a recognizable race of this species.

Neckeraceae

Neckera douglasii Hook. – Vancouver Island: 4 (15368) on a tree. – VK: Victoria – Cowichan Lake. – ECM: Victoria, Killarney Lake, 1930.

N. menziesii Hook. – Vancouver Island: 1 (15166) on *Acer macrophyllum*, 4 (15370) on trees. – WGP: Murtle River 14 (13140) on cliff; Murtle Lake 25 (13672) calcareous boulder bed. – VK: Cowichan Lake, on trees; Longworth, rock. – This common epiphytic species of the coastal forest is rare in the interior and perhaps grows exclusively on rocks there.

N. pennata Hedw. – WGP: Azure Lake 18 (14069) abundant on twigs of *Tsuga heterophylla* sprayed by mist from Rainbow Falls (see Fig. 3). – VK: Longworth, on *Populus trichocarpa*.

Thamnobryum leibergii (Britt.) Nieuwl. (*Porotrichum neckeroides* (Hook.) Williams) – WGP: Murtle Lake 20 (13729) boulders along river, by rapids.

Lembophyllaceae

Isothecium cristatum (Hampe) Robins. (*I. brewerianum* Lesq.) – Vancouver Island: 6 (14954) open calcareous rocks. – VK: Victoria. – ECM: Victoria, 1930.

I. spiculiferum (Mitt.) Ren. & Card. (*I. stoloniferum* (Hook.) Brid.) – Vancouver Island: 1 (15150, 15164, 15165, 15241), 2 (15337), 3 (15276); McMillan Prov. Park on Port Alberni Highway (15250). – A very common species on trees and logs in the coastal forests. – VK: Victoria; Cowichan Lake; Victoria – Cowichan Lake; Vancouver, Stanley Park; trees and wood.

The specimen 15337, collected on rocks, conforms with what is called var. *myurellum* (Kindb.) Crum, Steere & Anderson.

Hookeriaceae

Hookeria lucens (Hedw.) Sm. – VK: Vancouver, Stanley Park, common in forest floor; Capilano, forest floor; Prince Rupert, moist forest.

Leskeaceae

Lescuraea radicata (Mitt.) Mönk. (*Pseudoleskea radicata* (Mitt.) Kindb.) – WGP: Murtle River 15 (13874) on *Populus tremuloides*; Murtle Lake 20 (13333) stone on lake shore; Battle Mtn. 35, 37 (14228, 14860, 14878, 15045) very common in timber-line meadows, and particularly abundant in the *Valeriana sitchensis* meadows around the forest stands; also one of the major mosses of the forest floor throughout the orohemiarctic zone (HÄMET-AHTI 1965 b). – VK: Field, subalpine forest floor.

The timber-line meadow form is more robust than the specimens of lower elevations.

Thuidiaceae

Heterocladium dimorphum (Brid.) B.S.G. – Tulameen: 10 (13380) on shaded cliffs of the creek gorge.

H. procurrens (Mitt.) Rau & Harv. – WGP: Murtle River 15 (13854) tree bases in *Tsuga* forest; Murtle Lake 22 (13379) shaded rock outcrop, 24 (13664, 13671) big erratic block in dense forest.

Glaopodium bolanderi Best – WGP: Murtle Lake 20 (13730a) sparsely on moist hummock on rocky river shore by rapids, with *Tortella tortuosa*, *Campylium stellatum*, and *Thamnobryum leibergii*.

C. crispifolium (Hook.) Ren. & Card. – Vancouver Island: 1 (15169), 4 (15365) very abundant on fallen logs and lower trunks of trees. – VK: Langford; Cowichan Lake, on *Acer*; Vancouver, Stanley Park. – ECM: Victoria, rocks near stream, 1930.

Thuidium recognitum (Hedw.) Lindb. – WGP road: 12 (13796) dry pasture. – WGP: Hemp Creek 13 (7383) by spring-fed brook; Azure Lake (14012) rocks by waterfalls. – VK: Field, swamp; Blue River, fern forest; Longworth; Six Mile Lake, forest floor.

Abietinella abietina (Hedw.) Fleisch. – VK: Field, sub-alpine zone.

Helodium blandowii (Web. & Mohr) Warnst. – VK: Longworth; Six Mile Lake.

Amblystegiaceae

Cratoneuron commutatum (Hedw.) Roth var. *falcatum* (Brid.) Mönk. – WGP: Azure Lake 18 (14084) on wet rocks by the falls.

C. filicinum (Hedw.) Spruce – WGP road: 12 (13891) spring-fed brook by the lodge. – WGP: Hemp Creek 13 (7397) spring-fed brook; Azure Lake 18 (14010) wet rocks by the falls. – VK: Dorreen.

Campylium halleri (Hedw.) Lindb. – VK: Field, on stone in 'subalpine' zone.

C. stellatum (Hedw.) C. Jens. – WGP: Hemp Creek 13 (14003, 15156) eutrophic fen; Azure Lake 18 (14018) wet calcareous cliff; Murtle Lake 20 (13726) river bank, 22 (13382) lake shore, 27 (13747) calcareous rocks; Battle Mtn. 37 (14204) by brook. – Blue River: 34 (13956) meso-eutrophic fen, abundant. – VK: Victoria – Cowichan Lake.

No. 13747 and the VK specimen are referable to var. *protensum* (Brid.) Bryhn.

Amblystegium serpens (Hedw.) B.S.G. – WGP road: Hemp Creek 12 (13836, 13838) on rotten wood in the yard of Blake's farm.

Drepanocladus aduncus (Hedw.) Warnst. cf. var. *aduncus* – WGP road: 12 (13082, 13087, 13116, 14979) spring-fed calcareous soil, shallow pool and rotten wood in alluvial *Alnus* forest. – VK: Longworth.

D. exannulatus (B.S.G.) Warnst. var. *exannulatus* – WGP: Murtle Lake 20 (13306) meso-eutrophic fen; Battle Mtn. 37 (14130, 14201, 14202, 14340) along small brooks, in fens and in a pond. – Blue River: 34 (13979) on pond, 40 (13963, 13964, 13978, 15017) mesotrophic fens, pools and along brooks, common.

var. *purpurascens* (Schimp.) Herz. – WGP: Battle Mtn. 37 (15051) spring-fed brook in timber-line meadow. – Blue River: 40 (13997) spring-fed seepage at timber-line.

D. fluitans (Hedw.) Warnst. – WGP: Battle Mtn. 37 (14205, 14229, 14887, 14903), muddy shore of small pond, shallow pools in meadow, and alluvial *Eriophorum angustifolium* – *Carex magellanica* fen.

D. procerus (Ren. & H. Arnell ex Husn.) Warnst. – WGP road: 12 (13086) shallow pool in alluvial *Alnus* swamp. –

WGP: Murtle Lake 20 (13222, 13226, 13507) meso-eutrophic alluvial fens, 23 (13633) alluvial mesotrophic fen; Battle Mtn. 37 (14886) mesotrophic fen. – Blue River: 40 (13973) wet mesotrophic fen.

D. revolvens (Sw.) Warnst. s. lat. (incl. var. *intermedius* (Lindb.) Rich. & Wallace) – WGP: Hemp Creek 13 (14000, 14004, 14005) eutrophic fen; Azure Lake 18 (14021) wet calcareous rocks; Murtle Lake 20 (13221, 13227) meso-eutrophic alluvial fen; Stevens Lakes 33 (15055) spring-fed fen. – VK: Field.

D. tundrae (H. Arnell) Loeske – WGP: Battle Mtn. 37 (14172) spring-fed brook in mountain meadow.

D. uncinatus (Hedw.) Warnst. – Vancouver Island: 1 (15145b) wood. – Tulameen: 10 (10378) on shaded cliffs. – Manning Park: 11 (15422) on ground in dry *Pinus contorta* forest. – WGP road: 12 (13069, 13106) on soil in seral aspen forest and on wooden wall of old cabin. – WGP: Murtle River 14 (13151) wet cliff, 15 (13844) rotten wood; Azure Lake 17 (14034) cliff; Murtle Lake 20 (13213) rotten wood, 22 (13387) rotten wood, 25 (13513a) boulder bed, 26 (13268) on *Populus tremuloides*; Stevens Lakes 31 (14341) shore bank of lake; Battle Mtn. 37 (14208, 14880) mesic timber-line meadow, common. – Blue River: 40 (13928) timber-line meadow. – VK: Field; Kamloops; Blue River; Longworth, forest floor.

In the Wells Gray Park area this species is only rarely a component of the normal forest floor, although it is common on rotten wood, rocks and tree bases. However, in the timber-line meadows it is a characteristic moss of a wet seepage type that is dominated by *Caltha leptosepala* and *Trollius albiflorus*, and is also present in the seasonally wet *Carex nigricans* meadows. The habit of the meadow form is sometimes very different from the forest form – the former is sparsely branching, for instance – but whether they are taxonomically recognizable could not be decided.

D. vernicosus (Lindb. ex C. Hartm.) Warnst. – WGP: Murtle Lake 20 (13302) meso-eutrophic fen, fed by springs.

Hypohypnum ochraceum (Turn. ex Wils.) Loeske – WGP road: 12 (13024, 13889) submerged stones in rapids of Hemp Creek and on old wooden bridge across the creek. – WGP: Battle Mtn. 35 (14154) bank of brook by rapids, 37 (14129, 14148) on stone by brook and wet mineral soil in mountain meadows. – VK: Aleza Lake.

Calliergon cordifolium (Hedw.) Kindb. – WGP: Murtle Lake 23 (13635) alluvial mesotrophic fen; Battle Mtn. 37 (14131) on a brook in timber-line meadow.

C. sarmentosum (Wahlenb.) Kindb. – Blue River: 40 (13965, 13974) spring-fed seepage in forest and mesotrophic timber-line fen.

C. stramineum (Brid.) Kindb. – WGP: Murtle Lake 20 (13205, 13241, 13304), 30 (13467) common in meso-eutrophic fens; Battle Mtn. 35 (14889), 37 (14203, 14139) shallow fen pools. – Blue River: 34 (13930) small fen.

[*Calliergonella cuspidata* (Hedw.) Loeske – Reported by KUJALA (1945), p. 259) from Blue River but no specimens seen.]

Scorpidium scorpioides (Hedw.) Limpr. – WGP: Murtle Lake 20 (13226a) alluvial fen.

Brachytheciaceae

Tomentypnum falcifolium (Ren. ex Nichols) Tuomikoski n. comb. (*Camptothecium nitens* var. *falcifolium* Ren. ex Nichols, *Rhodora* 15: 12, 1913; CSA: *Tomentypnum nitens* var. *falcifolium*) – WGP: Murtle Lake 20 (13242, 13244), 23 (13581, 13582). – Probably quite common in the wet, open meso-eutrophic fens in the Murtle Lake area. The immixed

species include *Sphagnum warnstorffii*, *Drepanocladus vernicosus*, and *Calliergon stramineum*.

Dr. Risto Tuomikoski gave us permission to publish this new combination. He has collected this species in several places in Quebec and Newfoundland, coming to the conclusion that it is a very well-defined species rather than a variety of *T. nitens*. PERSSON & Sjörs (1960, pp. 264–265; PERSSON 1962, p. 21) also agreed with him. We confirm these statements but a more detailed account of this widespread North American species will be published elsewhere.

T. nitens (Hedw.) Loeske – WGP: Hemp Creek 13 (14002); Murtle Lake 20 (13303). – VK: Field; Six Mile Lake. – Common in eutrophic fens.

Homalothecium fulgescens (Mitt. ex C. Müll.) Lawt. (*Camptothecium lutescens* var. *occidentale* Ren. & Card.) – Vancouver Island: 1 (15154) on lower trunks of trees and fallen logs, 4 (15373) tree trunks. – ECM: Victoria, 1930.

H. megaphyllum (Sull.) Robins. – Vancouver Island: 2 (15340) open rock outcrop by waterfalls.

H. nevadense (Lesq.) Ren. & Card. – Manning Park: 11 (15436) calcareous cliff. – WGP road: 12 (13877) boulder in open pasture. – WGP: Murtle River 14 (13144, 13160) lava cliff and boulder in riverside forest; Murtle Lake 25 (13609, 13695) calcareous boulder bed. – VK: Kamloops, arid rocks.

H. nuttallii (Wils.) Jaeg. & Sauerb. – ECM: Victoria, 1931.

H. pinnatifidum (Sull. & Lesq.) Lawt. – VK: Victoria.

Brachythecium albicans (Hedw.) B.S.G. – Tulameen: 10 (10277, 10320) rotting wood in arid *Pseudotsuga* forest. – WGP road: 12 (7323, 13115, 13120, 13129, 13885) spring-fed calcareous soil in burned forest, on ground in seral *Populus* forest and on old wooden bridge. – WGP: Clearwater Lake 16 (7358) rotten wood on lake shore by boat harbour; Murtle Lake 20 (14851) forest floor; Battle Mtn. 37 (14787, 14831) in xeric timber-line meadow communities dominated by *Antennaria lanata* and *Vaccinium caespitosum*, rather sparsely. – VK: Victoria. – Common in various man-made habitats as in Europe but also in fairly arid forests, and even in mesic timberline meadows.

B. aspernum (Mitt.) Sull. – Vancouver Island: 1 (15145) rotten wood.

B. cf. campestre (C. Müll.) B.S.G. – VK: Six Mile Lake.

A few specimens from the Hemp Creek area (mainly from seral *Populus tremuloides* stands) were at first tentatively referred to this species and were so published by HÄMET-AHTI (1965 b, p. 282). However, most of them are poorly developed (all sterile) and we have later become uncertain about their identification. They may belong to *B. salebrosum*.

B. collinum (Schleich. ex C. Müll.) B.S.G. – Tulameen: 10 (10399) shaded cliff in the gorge of Lawless Creek.

B. curtum Lindb. (CSA: *B. starkei* var. *curtum*) – WGP: Hemp Creek 13; Murtle Lake 20 (13313, 13776) in swampy forests on ground and on bases of trees, 22 (13349) rotting wood in mesic forest, 23, pine forest. – Probably not very abundant in WGP (cf. HÄMET-AHTI 1965 b). – VK: Blue River; Aleza Lake; Six Mile Lake; mesic to moist forests.

The authors are convinced that *B. starkei* and *B. curtum*, as distinguished by LINDBERG (1879), are distinct species, although they are usually included in *B. starkei* in North America and Central Europe. The present material conforms well with *B. curtum* of North Europe, where the species are generally kept apart. We have seen no specimens of *B. starkei* s. Lindb. from western North America (cf. ROBINSON 1962, p. 126). KUJALA's material, identified as *B. starkei*, does not belong to this species, either. However, according to R. TUOMIKOSKI (verbal comm.) *B. starkei* is widespread in eastern Canada.

B. erythrorrhizon B.S.G. – WGP: Murtle Lake 20 (14827) moist *Abies* – *Picea* forest (uncertain), 22 (13513) boulder

bed; Stevens Lakes 33 (15047) moist spruce forest. – VK: Longworth, forest floor (among *Mnium drummondii*).

B. hylotapetum B. Higg. & N. Higg. – WGP: Hemp Creek 13 (14106, 14796, 14807, 15452); Murtle River 15 (13870); Murtle Lake 20 (13216, 13776a, 14818, 14852), 22 (13346), 25, 26 (14821), 28 (13472), 30. – HÄMET-AHTI (1965 b, Table 3) recorded it in 19 sample plots in the park. – VK: between Victoria and Cowichan Lake; Blue River; Six Mile Lake; Aleza Lake; Dorreen; Prince Rupert. – On ground, rotting logs and tree bases in old mesic coniferous forests, particularly in the humid oroboreal section (op. cit., p. 289).

It is surprising that this conspicuous and easily distinguished species has not been duly recognized until recently (HIGINBOTHAM & HIGINBOTHAM 1958, BIRD & OGILVIE 1964). It is to be noted that in KUJALA's (1945) phytosociological tables the denominations '*Brachythecium* – *Scleropodium* sp.', '*Brachythecium sceleropodium*' (nomen nudum), and '*Scleropodium* sp.' mean this species, although the smaller individuals were sometimes referred to '*Brachythecium* sp.' It is certainly a common species of moss in wide sections of B.C., being a characteristic component of some forest communities, e.g. of those included in the *Mitella* – *Tiarella* – *Rubus* type by KUJALA (1945, pp. 228–248).

B. latifolium Kindb. (CSA: *B. nelsonii*) – WGP: Murtle Lake 30 (13462) on ground in moist *Thuja plicata* forest; Stevens Lakes 33 (15047a) moist spruce forest near lake shore; Battle Mtn. 35 (14779) timberline forest. – VK: Aleza Lake.

B. plumosum (Hedw.) B.S.G. – WGP: Murtle Lake 20 (13728, 13738) on stony river shore and wet boulder in rapids.

[*B. reflexum* (Starke ex Web. & Mohr) B.S.G. – KUJALA (1945, p. 259) reported this species from Aleza Lake and Hazelton but no specimens were seen.]

B. rivulare B.S.G. – WGP: Hemp Creek 13 (7386) on a spring-fed brook; Murtle Lake 20 (13760) swamp forest by river. – VK: Blue River, fern forest; Longworth, by a creek; Six Mile Lake.

B. rutabulum (Hedw.) B.S.G. – VK: Terrace, forest floor.

B. salebrosum (Web. & Mohr) B.S.G. – Tulameen: 10 (10326). – Manning Park: 11 (15421) on ground in dry *Pinus contorta* forest. – WGP road: 12 (7399, 13032, 13067, 13839, 13841, 14840). – WGP: Hemp Creek 13 (14095, 14996); 3 mi. SE of Hemp Creek Ranger Sta. (15015); Murtle River 15 (13869, 13873); Murtle Lake 20 (13216a, 13776c) 22 (13353, 13567), 23, 26 (14822). – In WGP common in second-growth *Populus tremuloides* forests on the ground (cf. HÄMET-AHTI 1965 b), tree bases and stones, otherwise sparsely. – VK: Golden; Blue River; Longworth; Six Mile Lake.

See also the note under *B. campestre*.

B. turgidum (C. J. Hartm.) Kindb. – WGP: Azure Lake 17 (14037) cliff on lake shore.

Scleropodium touretii (Brid.) L. Koch – Vancouver Island: 4 (15369) trunks of trees.

Eurhynchium oregonum (Sull.) Jaeg. & Sauerb. – Vancouver Island: 1 (15146, 15184), 2 (15275, 15292, 15301) 4 (15372), 6. – VK: Langford; Cowichan Lake; Vancouver, Stanley Park; Capilano Canyon; Prince Rupert. – ECM: Victoria, 1931. – YI: Vancouver, Stanley Park. – A very common species of forest floors (see e.g. KUJALA 1945, pp. 340–341), rotting wood, and rocks in the coastal forests.

E. pulchellum (Hedw.) Jenn. – WGP road: 12 (14809) bare forest soil. – WGP: Hemp Creek 13 (14814) base of *Picea engelmannii*; Murtle River 15 (13861) rocks at the edge of Clearwater Canyon; Clearwater Lake 16 (7357) rotten wood; Murtle Lake 24 (13667) big erratic block, 25 (7327) boulder bed; Battle Mtn. 37 (14126) dry mountain

meadow, sparsely. — VK: Kamloops, *Pseudotsuga* forest; Longworth, rock.

E. stokesii (Turn.) B.S.G. (CSA: *E. praelongum* var. *stokesii*) — Vancouver Island: 1 (15159) on tree trunks, 4 (15366) basal trunks of trees in dense forest, 7 (15237, 15284) lawn in garden. — VK: Vancouver, Stanley Park; Prince Rupert.

E. substrigosum Kindb. (CSA: incl. in *E. pulchellum*; *E. fallax* (Ren. & Card.) Grout) — VK: Vancouver, Stanley Park, principal moss species in forest floor and rotten wood; Longworth, base of *Thuja*, forest floor and rocks; Aleza Lake; Six Mile Lake.

The well-developed specimens of *E. substrigosum* are so clearly distinct from *E. pulchellum* that it is recognized as a species, contrary to many other authors (cf. PERSSON 1952, p. 272).

Entodontaceae

Pterigynandrum filiforme Hedw. — WGP: Azure Lake 17 (14038) cliff on shore; Murtle Lake 24 (13665) big erratic block, 25 (7315, 7319) boulder bed.

Orthothecium chryseum (Schwaegr. ex Schultes) B.S.G. — WGP: Azure Lake 18 (14082) abundant on wet rocks by Rainbow Falls.

Pleurozium schreberi (Brid.) Mitt. — Vancouver Island: 2 (15281, 15334). — WGP: Hemp Creek 13; Murtle River 14; Azure Lake 17; Murtle Lake 20 (13342), 22, 23, 26, 27, 28, 29; Stevens Lakes 32; Battle Mtn., 3 mi. SW of Fight Lake (HÄMET-AHTI 1965 b). — Blue River: 19, 34. — VK: Victoria — Cowichan Lake; Longworth; Prince Rupert. — Below the orohemiarctic zone this is extremely common on forest floor and rotting wood. However, at lower elevations there are even mesic forests where the species is lacking (cf. HÄMET-AHTI 1965 b). Although diligently searched for in the timberline forests and meadows, it was not found.

Plagiotheciaceae

Plagiothecium denticulatum (Hedw.) B.S.G. — Vancouver Island: 1 (15205) rotten log. — WGP: Battle Mtn. 37 (14785) rotten log. — VK: Aleza Lake.

P. laetum B.S.G. — WGP: Murtle Lake 20 (13309) humus in wet spruce forest, 22 (13354, 13362, 13368, 13378) rotten wood, tree bases, shaded rocks and bare humous soil.

P. piliferum (Sw. ex C. J. Hartm.) B.S.G. — WGP: Murtle Lake 24 (13663) big erratic block, 25 (13657) boulder bed. — VK: Cowichan Lake.

P. undulatum (Hedw.) B.S.G. — Vancouver Island: 1 (15161, 15240) rotting wood. — Vancouver: 5 (15022) logs. — VK: Cowichan Lake; Vancouver, Stanley Park; Capilano Canyon; Prince Rupert.

Hypnaceae

H. circinale Hook. — Vancouver Island: 1 (15163, 15242) tree trunks, 2 (15278) sparsely on stony ground in open *Pseudotsuga* — *Gaultheria shallon* forest. — WGP: Murtle Lake 22 (13385) rotten wood, 28 (13474) on *Thuja plicata*. — VK: Cowichan Lake; Longworth; Hazelton.

H. dieckii Ren. & Card. — WGP: Murtle Lake 27 (13498) calcareous rocks on lake shore, abundant.

H. lindbergii Mitt. — WGP road: 12 (13884) banks of Hemp Creek. — WGP: Stevens Lakes 31 (14770) mineral soil on lake shore. — VK: Field.

H. pallescens (Hedw.) P. Beauv. — WGP: Murtle Lake 25 (13592) rotten wood.

H. pratense Koch ex Spruce — WGP: Hemp Creek 13 (7396) spring-fed brook. — VK: Blue River; Longworth.

H. revolutum (Mitt.) Lindb. — WGP: Murtle Lake 25 (7322) calcareous boulder bed on lake shore; Battle Mtn. 41 (14305, 14733) alpine rocks and soil. — VK: Field; Kamloops.

H. subimponens Lesq. — Vancouver Island: 1 (15177), 2 (15329), 4 (15371), 6 (14927). — VK: Langford; Cowichan Lake, on *Acer*. — ECM: Victoria, 1931. — A common species on trees and rocks in the coastal forests. The record for WGP published by HÄMET-AHTI (1965 b, p. 284) was based on *Ptilium crista-castrensis*.

Isopterygium borrierianum (C. Müll.) Lindb. (*I. elegans* (Hook.) Lindb.) — VK: Cowichan Lake; Stanley Park, on roots of trees; Aleza Lake, on rock.

I. pulchellum (Hedw.) Jaeg. & Sauerb. — WGP: Murtle Lake 25 (13511) boulder bed.

Ptilium crista-castrensis (Hedw.) De Not. — WGP road: 12. — WGP: Hemp Creek 13 (14093); Murtle River 14; Murtle Lake 20 (13295), 22 (13422), 23 (13630), 25, 26, 27 (13479), 28 — 30; Stevens Lakes 32. — Blue River: 19. — VK: Victoria — Cowichan Lake; Blue River; Longworth; Aleza Lake. — A very common species in the floor of the older forests below the orohemiarctic zone (cf. HÄMET-AHTI 1965 b). In the Wells Gray Park area it is even more abundant than *Hylocomium splendens*, unlike many other boreal territories.

Rhytidiaceae

Rhytidium rugosum (Hedw.) Kindb. — WGP road: ca. 8 mi. N of Clearwater Station (13236) in open *Pinus contorta* forest at edge of Clearwater Canyon.

Rhytidiopsis robusta (Hook.) Broth. — Manning Park: 11 (15416) dry pine forest. — WGP: Hemp Creek 13, dry pine and Douglas fir forests; Murtle Lake 22 (13345) forest floor in mesic stands, 28 mesic *Thuja* forest. — Blue River: 34 (13958) boulder in mesic forest, sparsely. — VK: Victoria — Cowichan Lake; Longworth; Six Mile Lake; Hazelton; Doreen; Terrace. — VI: Vancouver, Grouse Mtn.

A conspicuous robust species that is not particularly common in the Wells Gray Park area (cf. HÄMET-AHTI 1965 b).

Rhytidiadelphus calvescens (Wils.) Broth. (CSA: included in *R. squarrosus*) — WGP: Murtle Lake 20 (13231, 13762, 14824) very common in swampy *Thuja* forests, 30 (13471) abundant in swampy forests; Stevens Lakes 31 (14343) shore bank of lake; Battle Mtn. 35 (14778, 14873) mesic timberline forest, 37 (14879, 15160) mountain meadows, particularly abundant in the *Caltha leptosepala* — *Trollius abiflorus* seepage meadows. — Blue River: 40 (13971) sparsely along brook in fen. — VK: Victoria — Cowichan Lake; Blue River.

In Europe *R. calvescens* and *R. squarrosus* (Hedw.) Warnst. are fairly easy to keep apart and therefore they are commonly regarded as distinct species. However, the present material agrees with neither *R. calvescens* nor *R. squarrosus* in the sense we know them from N. Europe but are as if intermediate. The same difficulty was apparently encountered in Alaska by PERSSON & GJAEREVOLL (1959, pp. 21 — 23), who discussed the status of *R. calvescens*. Here the specimens are treated under *R. calvescens* chiefly because they come from truly virgin habitats (wet forests and timberline meadows) and many of them are fairly richly branched, although the branching is not as regular as in the typical *R. calvescens*. The nos. 13231 and 13471 fit to the European *R. calvescens* very well. In most specimens, indeed, the tips of the branches are rather stout and hardly flattened at all, and the red colouring of the stem does not extend very close to the apex (when examined macroscopically), in which characters it approaches *R. squarrosus* s. str. The latter species is also present in western North America (at least in the state of Washington). It is possible that our

material represents a 'Pacific' form in the complex. However, the Japanese *R. calvescens* is not identical with it. Thus the whole group is in need of thorough investigation.

R. loreus (Hedw.) Warnst. – Vancouver Island: 1 (15167) abundant on trees. – WGP: Azure Lake 17 (14068) sparsely on stump on lake shore, definitely rare. – VK: Victoria – Cowichan Lake; Vancouver, Stanley Park; Longworth; Hazelton; Dorreen; Prince Rupert, forest floor and bog forest. – ECM: Victoria. – YI: Vancouver, Stanley Park.

R. triquetrus (Hedw.) Warnst. – Vancouver Island: 1 (15186), 2 (15277), 7 (15238) lawn in garden. – WGP: Hemp Creek 13; Murtle River 14, 15 (13619); Azure Lake 17; Murtle Lake 20, 22 (13425), 26, 27. – VK: Victoria – Cowichan Lake; Blue River; Aleza Lake. – ECM: Victoria, 1930. – YI: Sicamous. – A common moss of the forest floor in the mesic forests rich in nutrients but was not seen in the upper oroboreal zone or above it (cf. HÄMET-AHTI 1965 b).

Hylocomiaceae

Hylocomium pyrenaicum (Spruce) Lindb. – WGP: Murtle River 15 (13850) abundant in fresh old *Tsuga* forest; Murtle Lake 20 (13775, 14825) rotten wood and forest floor in moist riverside forest. – VK: Blue River; Longworth; Aleza Lake; Six Mile Lake.

H. splendens (Hedw.) B.S.G. – Vancouver Island: 1 (15181), 2 (15283, 15298). – Tulameen: 10 (10385). – WGP: Hemp Creek 13; Azure Lake 17; Murtle Lake 20, 22 (13426), 25 (13575), 26, 27, 28. – Blue River: 19. – VK: Vancouver, Stanley Park; Capilano; Prince Rupert. – ECM: Victoria. – YI: Vancouver, Stanley Park. – Very common in forest floor and on shaded rocks. However, in the Wells Gray Park area it was not present at all in the timber-line forests or anywhere above them. Even in the middle and lower oroboreal forests it is by no means such a very constant and abundant moss of mesic forests as in the boreal forests in general.

In the coastal forests on Vancouver Island *H. splendens* attains a very large size and in other respects as well looks so very different in the field there that the author AHTI is inclined to believe that there is a distinct race of the species. Earlier in fact, at least PERSSON (1962) has suggested this and even provisionally used the name *H. 'giganteum'* (nomen nudum; non *H. giganteum* Bartr.) for it. The specimen 15181 is clearly this giant type, and 13426 from a much less luxuriant forest in Wells Gray Park also approaches it.

H. umbratum (Hedw.) B.S.G. – VK: Blue River; Longworth.

Polytrichaceae

Atrichum selwynii Aust. – WGP road: Hemp Creek 12 (13085). – WGP: Murtle River 14 (13146). – On bare soil on roadsides.

The specimens are dioecious. The specific status of this taxon is doubtful (cf. BIRD 1962).

A. undulatum (Hedw.) P. Beauv. – WGP: Murtle Lake 26 (14819) mesic forest. – VK: Aleza Lake. – ECM: Vancouver Island, Sooke, 1930.

Oligotrichum aligerum Mitt. – VK: Victoria – Cowichan Lake; Dorreen.

O. hereynicum (Hedw.) Lam. & DC. – WGP: Battle

Mtn. 41 (14330) rocky alpine soil. – VK: Victoria – Cowichan Lake, 'in nemore'.

O. parallelum (Mitt.) Kindb. – WGP: Murtle Lake (13759) on boulder in eutrophic swamp forest, sparsely.

Pogonatum alpinum (Hedw.) Röhl. var. *alpinum* – VK: Aleza Lake. The records published by HÄMET-AHTI (1965 b) probably belong to *Polytrichadelphus lyallii*.

var. *septentrionale* (Brid.) Brid. – WGP: Battle Mtn. 51 (14762) alpine rocks.

var. *macounii* (Kindb.) Card. & Thér. – VK: Prince Rupert. – ECM: East Sooke, 1930.

P. capillare (Michx.) Brid. – VK: Dorreen.

P. laterale (Brid.) Brid. (*P. contortum* (Schwaegr.) Sull.) – VK: Capilano Canyon; Dorreen; Prince Rupert. – YI: Vancouver, Stanley Park. – On rich mineral soil.

P. urnigerum (Hedw.) P. Beauv. – WGP: Murtle Lake 20 (13764) bare soil in swamp forest.

Polytrichum affine Funck (CSA: *P. juniperinum* var. *gracilius*; *P. strictum* Sm.) – WGP: Murtle Lake 21 (13781) alluvial sandy lake shore; Battle Mtn. 35 (14890), 37 (14128, 14989) hummock of fen, 39 (14248) among *Sphagnum fuscum* on rock outcrop along a brook in timberline scrub. Not common in the park even on peatlands. – VK: Prince Rupert, bog forest.

P. aurantiacum Hoppe ex Funck (CSA: *P. formosum* var. *aurantiacum*; *P. gracile* auct.) – WGP: Murtle Lake 20 (13217) mesotrophic alluvial fen on lake shore, abundant; Battle Mtn. 37 (14217) common in moist mountain meadow. – Blue River: 34 (13932, 13955) small fens, 40 (13972, 13988) wet mesotrophic fen near lake and in small pond.

Nos. 13955 and 13972 represent the type that has been called var. *anomulum*. They were growing largely submerged in alluvial habitats. The rest of the specimens are only tentatively referred to here, since the cells in the leaf sheaths are as in *P. formosum* s. str. (cf. GROUT 1937, Plate 61) and the leaf margins are very narrow. However, their habitats and also their general appearance are not at all as in *P. formosum*.

P. commune Hedw. – WGP: Murtle Lake 23 (13632) wet forest; Battle Mtn. 37 (14784, 14801, 14888, 14907), alluvial mountain meadows. – Probably common in wet forests, but overlooked.

P. formosum Hedw. s. str. – WGP: Murtle Lake 21 (13782) swamp forest, 22 (13411) shaded rock outcrop.

P. juniperinum Hedw. – Vancouver Island: 2 (15279, 15332), 8 (15069). – WGP road: 12 (13027). – WGP: Hemp Creek 13 (14820); Murtle River 14 (13134); Murtle Lake 26; Battle Mtn. 35 (14238, 14858), 37 (14135, 14215, 14792, 14866). – ECM: East Sooke, 1931. – A common species of forest floors in drier habitats, rocks and timber-line meadows.

P. norvegicum Hedw. – WGP: Battle Mtn. 42 (14264) small creek by snow-bed.

P. piliferum Hedw. – Vancouver Island: 2 (15336), 8 (15068). – WGP road: 12. – WGP: Murtle Lake 26 (13285); Battle Mtn. 37 (14216, 14222, 14790), 41 (14328). – Blue River: 19. – North Thompson River valley: Messiter (15002). – A common species in xeric habitats like sandy forests and rock outcrops. Also in the timber-line meadows and above them.

Polytrichadelphus lyallii Mitt. – WGP: Battle Mtn. 35 (14156), 37 (14815), 42 (14766). – Probably common in moist to wet timber-line meadows, though largely overlooked. *Pogonatum alpinum* of the timber-line forests reported by HÄMET-AHTI (1965 b) may also be this species.

V. Summary

An annotated list of about 259 species of mosses of southern and central British Columbia, based on about 1 000 specimens, is presented. Among them at least *Dicranum leioneuron* is new to the province. One new nomenclatural combination is published, viz. *Tomentypnum*

falcifolium (Ren. ex Nichols) Tuomik. A considerable number of oceanic and other western species are found in the main study area, Wells Gray Provincial Park, which is situated in the Cariboo Mountains, east-central British Columbia.

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