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Mosses Collected by Hawaiian Bog Survey of 1938

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INTRODUCTION

This paper is a complete record of the mosses collected by Miss Lucy M. Cranwell, Mr. O. H. Selling, and Dr. Carl Skottsberg during the Hawaiian Bog Survey in 1938 which was under the auspices of Bishop Museum. The list was compiled and annotated by Dr. Skottsberg excepting the description of the new species, *Campylopus tubulosus*, and the notes relating to *Campylopus fumarioli*, *Campylopus purpureo-flavescens*, *Grimmia torquata*, *Orthodontium pellucens*, and *Brachythecium hawaiiicum*. The responsibility for the determinations is mine. A set of specimens will be sent to Bishop Museum, Honolulu and a set retained by the herbarium of the Göteborg Botanical Garden.

Although some of the localities duplicate those in the Hawaiian moss flora,¹ the record as a whole gives a complete outline of the Hawaiian bog species. One new species, *Campylopus tubulosus*, and two noteworthy additions to the Hawaiian moss flora, *Grimmia torquata* and *Orthodontium pellucens*, are mentioned particularly in the text.

SPHAGNALES

FAMILY SPHAGNACEAE

Sphagnum palustre Linnaeus.

Hawaii: Kohala, Upper Hamakua Ditch Trail, in great profusion along road bank in many places and forming almost pure swamps

¹ See Manual of Hawaiian Mosses, B. P. Bishop Mus., Bull. 101, 1933; Supplement to Manual of Hawaiian Mosses, B. P. Bishop Mus., Occ. Papers 15 (8): 93-108, 1939.

(4501, 4509, 4511, 4539, 4642, 4669, 4673-4675). Apparently extending its area at present in the Kohala Mountains.

BRYALES

FAMILY DITRICHACEAE

Ceratodon purpureus Bridel.

Maui: in crater of Haleakala below Observation House (4459) and along Halemau [Halemauu] Trail (4467, 4468). Hawaii: Kau near end of Maunaiki 1920 flow (4605) and on prehistoric flow along Maunaiki Trail (4607, very depauperate).

FAMILY DICRANACEAE

Dicranella hawaiiica (C. Müller) Brotherus.

Kauai: Kohua Ridge, Kawaia Trail, very wet forest, alt. 3,500 ft. Maui: Puu Kukui, summit forest (4478 p.p.) and ravine below summit in streambed (4180 p.p., 4182 p.p., 4183, 4186 p.p., 4190, 4193 p.p., 4194 p.p., 4195, 4197 p.p. male, 4265).

Dicranella Hochreutineri Cardot.

Maui: Honokowai Valley along road below Haelaau (4104, 4106, 4107, 4109, 4110, 4113, 4068, 4069, 4077, 4433), also in caves of road bank (4102, 4116); Puu Kukui, ravine below summit in streambed (4264).

Campylopodium euphorocladum (C. Müller) Bescherelle.

Maui: Puu Kukui, summit forest (4478 p.p.) and ravine below summit in streambed (4180 p.p., 4182 p.p., 4189, 4191, 4194 p.p., 4199 p.p., 4200). Oahu: Koolau, Punaluu (4059).

Campylopus skottsbergii Brotherus.

Maui: Puu Kukui, summit bog, local (4536, 4537); ravine below summit, abundant in streambed (4095, 4177-4179, 4181, 4184, 4185, 4199 p.p., 4263).

Campylopus fumarioli C. Müller.

Molokai: Pepeopae, in bog, not common (4337, 4719). Maui: Honokowai Ridge, above Haelaau (4127); Puu Kukui, summit forest, epiphytic (4152) and in the swamp, scarce (4147).

No. 4152 is an unusual form with numerous microphyllous branchlets toward the ends of the sterile stems but differs in no structural particulars. Similar forms are not uncommon in other species of this large genus. The branchlets apparently serve the purpose of vegetative reproduction.

Campylopus introflexus (Hedwig) Bridel.

Hawaii: Kilauea, Kipuka Puaulo [Puaulu] (4692).

Campylopus densifolius Ångström.

Kauai: Kokee region, Kaluapuhi Trail (4697, 4699) and Alakai, Lehua maka noe [Lehuamakano] (4298).

Maui: Puu Kukui, summit forest, epiphytic (4324) and Honokowai Ridge above Haelaau (4081).

Campylopus hawaiiico-flexuosus (C. Müller) Paris.

Kauai: Kokee region, Kaluapuhi Trail (4708); Kohua ridge, Kawaia Trail, 3,500 ft. (4004); Alakai, bog near Kilohana (4283, 4318, 4541 p.p.) and in forest beyond Kawaikoi (4555). Molokai: forest at head of Waikolu Valley, on trunks (4410); bog forest, edge of Pepeopae bog, on trunks (4374, 4381, 4396) and in bog, scarce (4453). Maui: Puu Kukui, summit forest on trunks (4085, 4489, 4514). Hawaii: Kohala, Upper Hamakua Ditch Trail near second ditchman's house (4670 p.p.).

Campylopus purpureo-flavescens Hampe.

Kauai: Waimea, Kohua Ridge, Kawaia Trail, 3,500 ft. (4009, 4016, 4020, 4027, 4048); forest between Kawaikoi and Kilohana (4593, 4594); Alakai, Lehuamakano bog (4001 p.p., 4003, 4218, 4294) and bog near Kilohana (4282, 4285, 4310, 4311, 4319.) Molokai: Pepeopae, in bog, common (4332, 4333 p.p., 4334 p.p., 4346, 4357-4360, 4361 p.p., 4423, 4434). Maui: Puu Kukui, summit bog, common (4146, 4171, 4207, 4464, 4524, 4526, 4528, 4549, 4555 p.p.); lowest bog, above Nakalalua (4166, 4169, 4213, 4222). An important bog moss.

This extensive series shows rather conclusively that *C. purpureo-flavescens* and *C. hawaiiico-flexuosus* are only variants of the same species. The structural differences are negligible, and the various habit forms intergrade too closely to admit of any satisfactory specific distinction.

Campylopus wheeleri Hampe.

Kauai: vicinity of Kokee (4574).

Campylopus umbellatus (Arnott) Bartram.

Kauai: Kokee region, Kaluapuhi Trail (4707); Alakai, Lehuamakanoi (4001 p.p., 4029); bogs near Kilohana, 4,000 ft., especially in very wet places (4037, 4046, 4051, 4217, 4284, 4305, 4306 p.p., 4542, 4543, 4568, 4569 p.p., 4571). Oahu: Waianae, near Kolekole Pass (4686, 4693); Koolau, Kamehameha School (4425), Punaluu (4088). Maui: Honokowai, along road below Haelaau, 3,000 ft. (4054, 4057, 4062, 4066, 4082 p.p.); ravine below summit of Puu Kukui (4197 p.p.) and summit forest (4481). Hawaii: Kohala, along Upper Hamakua Ditch Trail (4249, 4251, 4257, 4613, 4641, 4657 p.p., 4672); Kau-Kona belt road, west branch of 1907 flow (4439, 4604).

Campylopus exasperatus Bridel.

Oahu: Koolau, Keanamanu Valley (4437). Hawaii: Kau, Mauniki [Maunaiki] 1920 flow (4612); Kau-Kona belt road, Hoopuloa 1926 flow (4597-4599); west slope of Mauna Loa, Koa Mill, 520 m., Alika 1919 flow (4429 p.p., 4596, 4612).

Campylopus (Eucampylopus) tubulosus, new species.

Gracilescens, densissime caespitosus, caespites nigricantes, haud nitidi. Caulis erectus, ad 7 cm. altus, parce tomentosus, simplex vel dichotome ramosus. Folia sicca et humida erecto-patentia, setosa, e basi contracta anguste oblonga, concava, sensim subulato-acuminata, arcte tubulosa, in pilum hyalinum denticulatum producta, ad 5-6 mm. longa; cellulae basilares breviter rectangulares, marginales angustissime lineares, alares numerosae, ovali-hexagonae, tenerae, hyalinae, superiores anguste rhomboideae. Caetera ignota.

Slender, very compactly tufted plants without luster, green only at the extreme tips, brown or black below. Stems erect, closely matted together, simple or dichotomously branched, to 7 cm. high, slightly tomentose. Leaves erect-spreading, bristly, gradually subulate-acuminate from a contracted narrowly oblong concave base, strongly tubulose above, to 5 or 6 mm. long, ending in a short hyaline denticulate hair point; costa smooth on the back, excurrent; basal and supra alar cells short rectangular, narrowly linear toward the margins; alar cells oval-hexagonal, delicate, hyaline, in a well defined group extending nearly to the costa; upper lamina cells obliquely and narrowly rhomboidal.

A smaller plant than *C. Skottsbergii* Brotherus with shorter leaves which are spreading or slightly falcate when dry giving the stems a peculiar bristly appearance. The strongly tubulose lamina and the shorter supra alar cells are also diagnostic characters.

Kauai: on the summit of Waialeale, Aug. 23, 1938, 4033, type.
Maui: west Maui, found with *Rhynchospora* in summit bog, July 23, 1938 (4143, 4165, 4168).

The summit bogs of Waialeale and Puu Kukui are probably the wettest spots in the world. The black coloring in all but the youngest leaves is evidently one result of the continuous excess moisture.

Dicranodontium falcatum Brotherus.

Kauai: Alakai, bogs near Kilohana (4286, 4288, 4289). Maui: Puu Kukui, summit forest, local (4058, 4490) and in bog outside (4525). Hawaii: Kohala, along Upper Hamakua Ditch Trail, in a cave at head of Waima Valley (4277, 4631, 4664, 4647, 4649) and on road bank near first house (4619, 4624, 4628).

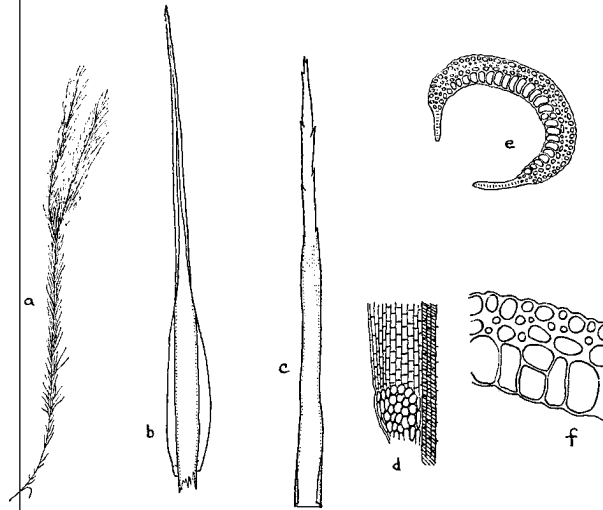


FIGURE 1.—*Campylopus tubulosus*: a, plant $\times 1$; b, leaf $\times 11$; c, apex of leaf $\times 80$; d, one side of leaf base $\times 80$; e, cross section near mid-leaf $\times 80$; f, part of e $\times 225$.

Amphidium cyathicarpum (Montagne) Brotherus.

Maui: Haleakala, in the crater below Observation House (5592).

Holomitrium seticalycinum C. Müller.

Kauai: Kokee region, Kaluapuhi Trail (4688, 4701, 4702). Maui: Nakalalua, in forest (4083); Puu Kukui, summit forest, frequent (4039, 4114, 4151, 4201 p.p., 4325, 4497). Hawaii: Kohala, Upper Hamakua Ditch Trail, swamp forest between first and second house (4661).

Dicranum speirophyllum Montagne.

Kauai: Kokee region, Kaluapuhi Trail (4710, 4712, 4713); Alakai, bogs of Kilohana (4589). Molokai: forest at head of Waikolu Valley (4226, 4227), swampy forest along bog of Pepeopae (4378-4380, 4720) and in bog, under shrubs and *Oreobolus* cushions (4331, 4349-4355, 4369, 4435, 4717). Maui: Puu Kukui in summit bog (4098-4100, 4210, 4328) and in bog lower down toward Nakalalua (4167). Hawaii: Kilauea fern forest (4534) and along road to Hilo (4240).

Dicranum speirophyllum var. **breviflagellare** (C. Müller) Bartram.

Maui: Honokowai ridge above Haelaau, in very wet forest (4126); Puu Kukui, summit bog (4523). Hawaii: Kohala, Upper Hamakua Ditch Trail between first and second house, on trunk of *Pritchardia* (4650, 4665).

FAMILY LEUCOBRYACEAE

Leucobryum gracile Sullivant.

Kauai: Kokee, Kaluapuhi Trail (4685, 4698); Alakai, forest between Kawaikoi and Kilohana (4585). Oahu: Waianae, Kaala (4266); Koolau, Pupukea-Kahuku Trail (4687). Molokai: forest at head of Waikolu Valley, on trunks (4411); swampy forest at edge of Pepeopae bog, on trees and ground (4398, 4404). Maui: Honokowai Ridge above Haelaau in wet forest (4121).

Leucobryum hawaiiense (Reichardt) Bartram.

Kauai: Kohua Ridge, Kawaia Trail, 3,500 ft. (4052); Alakai, Lehuamakanoi (4028); forest between Kawaikoi and Kilohana (4584); bogs of Kilohana, in scrub on bases of trees (4546), and in swamp (4569 p.p.); Waiialae stream, in forest (4005). Oahu: Koolau, head of Kipaupau [Kaipapau] Gulch, in small swamp (4715). Maui: Honokowai Valley, on road bank below Haelaau (4026). Hawaii: fern forest below Kilauea along road to Hilo (4237).

Leucobryum hawaiiense var. **sofatarae** (C. Müller) Bartram.

Kauai: Alakai, Lehuamakanoi in bog (4291-4293, 4295, 4296, 4300, 4303, 4304); forest between Kawaikoi and Kilohana (4558); bogs of Kilohana (4306 p.p., 4307, 4322). Molokai: head of Waikolu Valley in wet forest (4230). Maui: Puu Kukui, summit forest (4488).

Leucobryum pachyphyllum C. Müller.

Kauai: Alakai, bogs between Kawaikoi Gulch and Kilohana (4309, 4312, 4313, 4316, 4321, 4543 p.p.). Molokai: Pepeopae bog (4335, 4342, 4344, 4441-4444, 4449 p.p., 4450, 4473, 4474). Maui: Puu Kukui, summit bog (4327, 4520, 4547, 4557, 4564); lower down, bog above Nakalalua (4211, 4216, 4714 p.p.).

An important bog moss.

FAMILY CALYMPERACEAE

Syrrhopodon hawaiiicus C. Müller.

Kauai: Alakai, wet forest between Kawaikoi and Kilohana (4580). Maui: Puu Kukui, summit forest (4412). Hawaii: Kohala, Upper Hamakua Ditch Trail, road bank between first and second house (4660); fern forest below Kilauea on road to Hilo (4235).

FAMILY ENCALYPTACEAE

Encalypta scabrata Bartram.

Maui: Haleakala, along upper part of Halemauu Trail (4457); in crater below Observation House (5594).

FAMILY POTTIACEAE

Didymodon recurvirostris (Dickson) Jennings.

Maui: Haleakala, in crater below Observation House (4495).

Barbula vinealis Bridel, variety **cylindrica** (Taylor) Boulay.

Maui: Haleakala, in crater below Observation House (5591).

FAMILY GRIMMIACEAE

Grimmia haleakalae Reichardt.

Maui: Haleakala, on summit (4383) and along Halemauu Trail (4456).

Grimmia trichophylla Greville.

Maui: Haleakala, below Observation House (4463 p.p., 4472 p.p.).

Grimmia torquata Hornschuch.

Maui: Haleakala, in crater just below the Observation House, Aug. 4, 1938, (4458, 4463 p.p., 4479).

Distribution: Arctic-subarctic Europe, Scandinavia, mountains of central Europe, Greenland, North America from Alaska to Wyoming and California.

New to the Hawaiian islands. I have no adequate explanation to offer for the occurrence of this well-known boreal species in Hawaii. It is a most unusual record and seems to suggest in an obscure way some link with terrestrial areas to the north. The collections are highly significant and with further collateral information should form a basis for some interesting surmises.

Rhacomitrium crispulum Hooker, J. D., and Wilson.

Kauai: summit of Waialeale (4035).

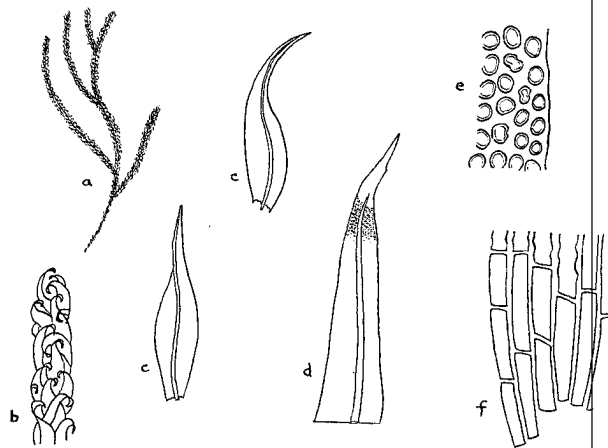


FIGURE 2.—*Grimmia torquata*: a, plant $\times 1$; b, tip of stem $\times 5$; c, leaves $\times 15$; d, apex of leaf $\times 80$; e, upper leaf cells $\times 225$; f, basal leaf cells $\times 225$.

Rhacomitrium lanuginosum (Hedwig) Bridel var. **pruinatum** Hooker, J. D., and Wilson.

Kauai: summit of Waialeale, 5,080 ft. (4031, 4038); bog below the summit (4044); Alakai, bogs of Kilohana, common (4229, 4308, 4314, 4315, 4317, 4323, 4541 p.p., 4570). Molokai: Pepeopae bog, common (4345, 4348, 4364-4367, 4438, 4445, 4448, 4451, 4475, 4476, 4718). Maui: Puu Kukui, summit bog (4516, 4519, 4522, 4535, 4551); bog below summit, above Nakalalua (4220); Haleakala, in crater below Observation House (4462, 4471) and along Halemauau Trail (4469).

Hawaii: truck road on Mauna Loa above Kilauea, 7,000 ft. (4609); Kau, Maunaiki 1920 flow (4427, 4428); Hoopuloa 1926 flow (4567); Koa Mill, Alika 1919 flow (4533, 4567, 4601, 4602, 4608).

Important and conspicuous in the bogs of high altitudes and on recent lava flows.

FAMILY FUNARIACEAE

Funaria subintegra Brotherus.

Maui: Puu Kukui, ravine below summit (4187, 4188).

FAMILY BRYACEAE

Orthodontium pellucens (Hooker) Bryol. Eur.

Kauai: Waimea, Kohua ridge, Kawaia Trail, 3,500 ft., Aug. 19, 1938 (4019).

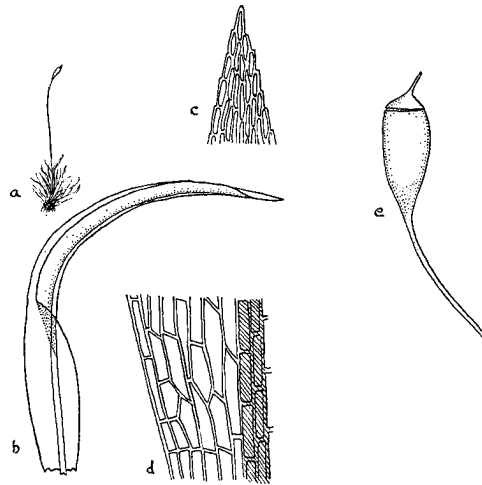


FIGURE 3.—*Orthodontium pellucens*: a, plant $\times 1$; b, leaf $\times 17$; c, apex of leaf $\times 80$; d, one side of leaf base $\times 80$; e, moist capsule $\times 9$.

New to the Hawaiian islands. A very interesting addition to the Hawaiian moss flora. The species has a well-known range from Ecuador and Colombia northward through Central America to California, but a critical study of the allied species will probably result in an extended synonymy and a broader distribution as the distinctions are slight and of doubtful value.

Bryum megalostegium Sullivant.

Maui: ravine below summit, in stream bed (4196, 4198). Sterile, but probably referable to this species.

Bryum crassicoatum Brotherus.

Maui: Haleakala, in crater below Observation House (5593).

Bryum argenteum Hedwig var. **lanatum** (Palisot de Beauvois)

Bryol. Eur.

Maui: Haleakala, Kaupo Gap near Waineke Spring (4470).

Rhodobryum giganteum (Hooker) Schimper.

Maui: Puu Kukui on summit, in scrub, very scarce (4144).

FAMILY RHIZOGONIACEAE

Rhizogonium pungens Sullivant.

Kauai: Kokee (4575); Alakai, forest between Kawaikoi and Kilohana (4587). Oahu: Waianae, near Kolekole Pass (4681); Koolau, Punaluu (4064).

Rhizogonium spiniforme (Hedwig) Bruch.

Kauai: Alakai, forest between Kawaikoi and Kilohana (4577); Waialae Valley on trees (4002). Molokai: head of Waikolu Valley in forest (4228, 4384, 4423 p.p.); Pepeopae bog forest (4418). Maui: Honokowai Ridge, in wet forest near and above Haelaau, about 3,000 ft. (4065, 4093, 4094, 4138, 4175, 4176, 4192). Hawaii: Kohala, Upper Hamakua Ditch Trail, swampy forest between first and second house (4658); Kilauea, fern forest (4610) and in forest along road to Hilo (4232).

FAMILY HYPNODENDRACEAE

Limbella tricostata (Sullivant) C. Müller.

Kauai: stream bed near summit of Waialeale (4017, 4030); Waialae Valley on trees (4043); Kokee (4290, 4302).

FAMILY BARTRAMIACEAE

Philonotis falcata (Hooker) Mitten.

Maui: Honokowai Valley, wet clayey road bank below Haelaau, 2,600 ft. (4067); Haleakala, Kaupo Gap near Waineke Spring (4460, 4466).

Philonotis turneriana (Schwaegrichen) Mitten.

Oahu: Waianae, near Kolekole Pass (4689). Molokai, Wailau Trail (4060). Maui: Honokowai Valley, wet clayey road bank below

Haaleaau, 2,600 ft. (4055, 4056, 4070-4072, 4082 p.p., 4101, 4108).
Hawaii: Kohala, Upper Hamakua Ditch Trail, cave at head of
Waima Valley (4260); head of Koiawe Valley (4244, 4247, 4248,
4538, 4560, 4562).

Breutelia arundinifolia (Duby) Fleischer.

Kauai: boggy places near summit of Waialeale (4034). Maui:
summit bog of Puu Kukui, common (4170, 4202, 4205, 4515, 4521,
4527, 4532); lower down, bog above Nakalalua (4142, 4203, 4214).
Hawaii: Kohala, Upper Hamakua Ditch Trail (4625, 4626, 4640,
4653, 4654).

FAMILY ORTHOTRICHACEAE

Macromitrium piliferum Schwaegrichen.

Kauai: Kokee region, Kaluapuhi Trail (4684). Oahu: Koolau,
Keanamanu Valley (4426). Molokai: forest at head of Waikolu
Valley (4422) and on edge of Pepeopae bog (4386). Maui: Puu
Kukui, summit forest (4117, 4136, 4201 p.p., 4529). Hawaii: Kilauea,
Kipuka Puauulu (4682).

Macromitrium owahiense C. Müller.

Kauai: Kokee (4573). Molokai: forest at head of Waikolu Val-
ley (4221); rim of ravine near upper Maunahui camp (4385); edge
of Pepeopae bog (4430). Maui: Puu Kukui, first bog above Naka-
lalua, on *Metrosideros* (4141, 4150). Hawaii: Kohala, Upper Hama-
kua Ditch Trail, head of Koiawe and Alakahi Valleys (4299, 4643,
4651, 4652).

FAMILY RHACOPILACEAE

Rhacopilum cuspidigerum (Schwaegrichen) Mitten.

Hawaii: Kohala, Upper Hamakua Ditch Trail, head of Koiawe
Valley (4246); Mauna Loa, Koa Mill, Alika 1919 flow in crevices
(4603, 4611 p.p.).

FAMILY TRACHYPODACEAE

Trachypus mauiensis Brotherus.

Kauai: Kokee (4582).

Trachypodopsis ornans (Reichardt) Fleischer.

Kauai: summit of Waialeale on *Cheirodendron* (4018, 4032); Alakai, forest between Kawaikoi and Kilohana (4576) and bogs of Kilohana, in scrub (4554). Maui: Puu Kukui, summit forest, very abundant, hanging down (4157 p.p., 4158, 4159, 4505, 4506, 4512); summit bog with dwarf *Metrosideros* (4172, 4209, 4480, 4518; bog lower down, above Nakalalua (4045, 4167, 4219, 4714 p.p.). Hawaii: Kohala, Upper Hamakua Ditch Trail, scrub forest between first and second house (4627, 4629, 4630, 4657 p.p.).

A very conspicuous tree moss, even forming festoons.

FAMILY METEORACEAE

Aërobryopsis longissima (Dozy and Molkenboer) Fleischer.

Molokai: forest at head of Waikolu Valley (4414). Maui: Puu Kukui, summit forest (4502 p.p.). Hawaii: Kohala, Upper Hamakua Ditch Trail, head of Koiawe and Alakahi Valleys (4620, 4638 p.p.); Kilauea, forest along road to Hilo (4241).

Barbella trichophora (Montagne) Fleischer.

Kauai: Kohua Ridge, Kawaia Trail, 3,500 ft. (4053). Molokai: forest at head of Waikolu Valley (4370, 4373). Hawaii: Kilauea, Kipuka Puauu (4694).

Floribundaria floribunda (Dozy and Molkenboer) Fleischer.

Oahu: Waianae, Kaala (4134, 4269-4273).

FAMILY NECKERACEAE

Baldwinella kealeensis (Reichardt) Bartram.

Oahu: Waianae, Kaala (4267). Maui: Honokowai Valley, along road below Haelaau, 2,600 ft. (4061, 4111) and above Haelaau (4115); Puu Kukui, summit forest (4504). Hawaii: Kohala, Upper Hamakua Ditch Trail, cave at head of Waima Valley (4254, 4279, 4645); head of Koiawe Valley (4680, 4716).

Homaliodendron flabellatum (Dickson) Fleischer.

Kauai: Kokee region, Kaluapuhi Trail (4703); Alakai, forest between Kawaikoi and Kilohana (4591); Waialae Valley, on trees (4023, 4024). Maui: Honokowai Valley, Haelaau, 3,000 ft. (4137) and farther up the ridge, frequent (4073, 4091, 4092, 4119, 4124, 4125,

4130); Puu Kukui, summit forest (4502 p.p., 4503). Molokai: forest at head of Waikolu Valley (4224, 4233); bog forest of Pepeopae, on the ground (4406) and on trunks (4389-4391, 4393). Hawaii: Kohala, Upper Hamakua Ditch Trail, swamp forest between first and second house (4644 p.p.); Kilauea, along road to Hilo, dense forest (4234, 4236).

FAMILY HOOKERIAACEAE

Distichophyllum paradoxum (Montagne) Mitten.

Kauai: Kohua Ridge, Kawaia Trail, 3,500 ft. (4014, 4015). Oahu: Waianae, Kaala (4133). Molokai: Pepeopae bog forest, on the ground (4400, 4403). Maui: Puu Kukui, summit forest (4485, 4486). Hawaii: Kohala, Upper Hamakua Ditch Trail, cave at head of Waima Valley (4252, 4255, 4262, 4280, 4663, 4668); head of Koiawe Valley (4563, 4679); Kilauea, in dense forest along road to Hilo (4242 p.p.).

Distichophyllum freycinetii (Schwaegrichen) Mitten.

Kauai: Kohua Ridge, Kawaia Trail (4006, 4007) Waialae Valley on trunks (4022 p.p.). Molokai: Pepeopae bog forest, on the ground (4405, 4407, 4415). Maui: Honokowai, ridge above Haelaau (4129); summit of Puu Kukui in forest (4487).

Hawaii: Kohala, Upper Hamakua Ditch Trail, cave at head of Waima Valley (4276, 4614, 4615, 4646, 4648), and roadside (4419); head of Koiawe Valley (4691); Kilauea, in dense forest along road to Hilo (4242 p.p.).

Hookeriopsis purpurea (C. Müller) Brotherus var. **ligulacea** (C. Müller) Bartram.

Kauai: Waimea, Waialae Valley on trees (4022 p.p.). Hawaii: Kohala, Upper Hamakua Ditch Trail, head of Koiawe Valley (4245).

FAMILY THUIDIACEAE

Thuidium plicatum Mitten.

Kauai: Kokee, Kaluapuhi trail (4683, 4711); Kokee stream (4287); Alakai, scrub in bog not far from Kilohana, 4,000 ft. (4544). Molokai: Upper Maunahui camp, edge of ravine (4572); head of Waikolu Valley, in forest (4225, 4382, 4421); swamp forest of Pepeopae (4387 p.p., 4388, 4416). Maui: Puu Kukui, summit forest on

trees (4508, 4531, 4162, 4163). Hawaii: Kohala, Upper Hamakua Ditch Trail, cave at head of Waima Valley (4634 p.p.); swamp forest between first and second houses (4656); Mauna Loa, Koa Mill, Alika 1919 flow, in depression with *Sadleria* (5530, 4566 p.p., 4600).

Thuidium hawaiiense Reichardt.

Kauai: Waimea, Puu Ka Pele (4595); Alakai, forest between Kawaikoi and Kilohana (4579); Waialae Valley, on trees (4010). Oahu: Koolau, Punaluu (4063). Molokai: Pepeopae bog forest, on the ground (4420). Maui: Honokowai, ridge above Haelaau (4089, 4090, 4097); Puu Kukui, summit forest, on stem bases and ground (4155, 4156, 4465, 4483, 4492); Kaana Valley (4148). Hawaii: Kohala, Upper Hamakua Ditch Trail, cave at head of Waima Valley (4256, 4259, 4616, 4632), and road bank below first house (4250, 4561); Kilauea, dense forest along road to Hilo (4238).

FAMILY BRACHYTHECIACEAE

Pleuropus wilkesianus (Sullivant) Brotherus.

Maui: Honokowai, along trail above Haelaau (4076, 4084, 4087, 4096, 4128 p.p., 4131). Hawaii: Kohala, Upper Hamakua Ditch Trail, below first house (4558); Kilauea, dense forest along road to Hilo (4243 p.p.).

Brachythecium hawaiiicum Bartram.

Maui: Haleakala, along upper Halemanu Trail, Aug. 5, 1938 (4455), robust form.

Previously known only from island of Hawaii.

Eurhynchium selaginellifolium (C. Müller) Bartram.

Hawaii: Kohala Mountains, near head of Koiawe Valley (5590).

FAMILY PLAGIOTHECIACEAE

Plagiothecium draytoni (Sullivant) Bartram.

Kauai: Alakai, forest between Kawaikoi and Kilohana (4590); Kilohana (4281). Molokai: Pepeopae bog forest, on trunks (4375, 4387 p.p., 4392). Maui: Honokowai, ridge above Haelaau (4123); Puu Kukui summit forest, on stems (4157 p.p., 4160, 4161, 4493, 4496). Hawaii: Kohala, Upper Hamakua Ditch Trail, cave at head

of Waima Valley (4618, 4633, 4634 p.p.); head of Koiawe Valley, along road, with *Sphagnum*, etc. (4617, 4621, 4622, 4639, 4667, 4671, 4677); head of Alakahi Valley (4638 p.p., 4670 p.p.); Mauna Loa, Koa Mill, Alike 1919 flow, in depressions, with *Sadleria* (4432, 4565, 4566 p.p.).

FAMILY SEMATOPHYLLACEAE

Brotherella opaeodon (Sullivant) Brotherus.

Maui: Puu Kukui, summit forest (4140, 4154, 4484, 4491, 4494, 4513), and in bog, frequent (4149, 4424, 4552); swamp above Nakalua (4326).

Acroporium fuscoflavum (C. Müller) Brotherus.

Kauai: Alakai forest near Kilohana, 4,000 ft. (4040), and between Kawaikoi and Kilohana (4586); bogs of Kilohana, frequent (4320, 4540) and in scrub (4545); Lehuamakanoi, on twig (4297). Oahu: Waianae, Kaala (4268). Molokai: forest at head of Waikolu Valley (4409) and near bog of Pepeopae (4376, 4377); Pepeopae bog, common (4333 p.p., 4334 p.p., 4336, 4339, 4341, 4361 p.p., 4362, 4363, 4449 p.p.). Maui: Honokowai, ridge above Haelaau in wet forest (4078, 4139, 4173, 4174); Puu Kukui, summit bog (4145, 4206, 4548, 4553 p.p.). Hawaii: Kohala, Upper Hamakua Ditch Trail, swamp forest between first and second houses (4644 p.p., 4662, 4690); Kilauea, along road to Hilo in dense forest (4243 p.p.).

Trichosteleum hamatum (Dozy and Molkenboer) Jaeger.

Kauai: Kohua ridge, Kawaia Trail, 3,500 ft. (4008 p.p., 4011-4013, 4049, 4050); Alakai, forest between Kawaikoi and Kilohana (4578); Waialae Valley, on trees (4042). Molokai: forest at head of Waikolu Valley (4223); Pepeopae bog (4340) and forest (4394, 4395, 4397, 4399, 4417). Maui: Honokowai, ridge above Haelaau (4074, 4075, 4079, 4086, 4118, 4135); Puu Kukui, summit forest (4482). Hawaii: Kohala, Upper Hamakua Ditch Trail, head of Koiawe Valley (4676); Kilauea, Fern Forest (4559) and similar forest along road to Hilo (4239, 4243 p.p.).

Taxithelium undulatum (Sullivant) Bartram.

Kauai: Kokee, Kaluapuhi Trail (4700). Molokai: Pepeopae bog forest, on trunks (4387 p.p.).

FAMILY HYPNACEAE

Ectropothecium arcuatum (Sullivant) Mitten.

Kauai: Kokee, Nualoha Trail (4343). Hawaii: Kohala, Upper Hamakua Ditch Trail, cave at head of Waima Valley (4253, 4275) and near first house (4556); Mauna Loa, Koa Mill, Alika 1919 flow, bottom of tree mould (4611 p.p.).

Isopterygium albescens (Schwaegrichen) Jaeger.

Hawaii: Kohala, Upper Hamakua Ditch Trail, below first house (4572) and in forest at head of Koiawe Valley (4659).

Vesicularia graminicolor (Ångström) Brotherus.

Maui: Honokowai Valley, road bank below Haelaau, 2,600 ft. (4102).

Ctenidium decurrens (Sullivant) Brotherus.

Molokai: Pepeopae bog, frequent (4438, 4440, 4447, 4452, 4454). Maui: Puu Kukui, common in summit bog (4204, 4208, 4231, 4329, 4330, 4461, 4500, 4517, 4550); swamp above Nakalalua (4215). Hawaii: Kohala, Upper Hamakua Ditch Trail, cave at head of Waima Valley (4635); head of Koiawe Valley (4581, 4636, 4678); Mauna Loa, Koa Mill, Alika 1919 flow (4429 p.p.).

Ctenidium elegantulum Brotherus.

Maui: Honokowai, ridge above Haelaau (4080, 4122).

FAMILY POLYTRICHACEAE

Pogonatum baldwinii (C. Müller) Paris.

Kauai: Waimea, Alakai, forest between Kawaikoi and Kilohana (4583); Waialae, on trees (4041). Oahu: Koolau, head of Kaipapau Gulch (4695). Maui: Honokowai Valley, road bank below Haelaau, 2,600 ft. (4105, 4112); Puu Kukui, summit forest (4478 p.p.) and ravine below summit in stream bed (4186 p.p.). Hawaii: Kohala, Upper Hamakua Ditch Trail, cave at head of Waima Valley (4258, 4261, 4278) and head of Koiawe Valley (4666).