Hawaiian Moss Names

Bartram (1933) did not include Hawaiian names in his manual of Hawaiian mosses. The Hawaiian dictionary by Pukui & Elbert (1986) lists two general terms for mosses, limu and huluhulu, and names for specific types of mosses and liverworts. Unfortunately, only one of these specific names has a scientific name attached to it, *Thuidium hawaiiense* (now *T. cymbifolium*). The rest are orphan names that cannot be attached to known species unless other records can be found. A dictionary of modern Hawaiian by Komike Hua’olelo (2003) lists another general term, mākōpi`i, and one specific term hulu pōʻēʻē for *Sphagnum* moss.

Table 10. Known Hawaiian words for mosses, liverworts, and a lichen.

<table>
<thead>
<tr>
<th>Hawaiian</th>
<th>English definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ekaha</td>
<td>a moss growing on rotted trees, also limu ekaha</td>
</tr>
<tr>
<td>hini hini `ula</td>
<td>an upland moss</td>
</tr>
<tr>
<td>huluhulu a Ka`au hele moa</td>
<td>a moss said to grow only in Palolo Valley, Honolulu, named for Ka`au-hele-moa a legendary cock defeated in battle by a hen. She pulled his feathers which became this moss. It is used in leis.</td>
</tr>
<tr>
<td>hulu pōʻēʻē</td>
<td>Sphagnum</td>
</tr>
<tr>
<td>huluhulu</td>
<td>kinds of seaweeds and mosses</td>
</tr>
<tr>
<td>huluhulu a `ilio</td>
<td>a green, velvety carpet-like mountain moss. The spore cases rise above the plants. Lit. fur like a dog.</td>
</tr>
<tr>
<td>iliohe</td>
<td>a name reported for a green freshwater moss</td>
</tr>
<tr>
<td>kala maka pi`i</td>
<td>same as mākole mākō pi<code>i and kale maka pi</code>i</td>
</tr>
<tr>
<td>kalau ipo</td>
<td>a moss found in water</td>
</tr>
<tr>
<td>kale maka pi`i</td>
<td>variant of kala maka pi`i, a moss</td>
</tr>
<tr>
<td>lī pepei ao</td>
<td>1. a seaweed 2. a freshwater moss, usually qualified by wai</td>
</tr>
<tr>
<td>lī poa kua hiwi</td>
<td>a non-edible mountain moss as opposed to the edible lī poa</td>
</tr>
<tr>
<td>limu</td>
<td>general name for plants including mosses, liverworts, lichens, etc..</td>
</tr>
<tr>
<td>limu <code>ahu</code>ula</td>
<td>an upland moss</td>
</tr>
<tr>
<td>limu ahi</td>
<td>a tree moss or liverwort</td>
</tr>
<tr>
<td>limu haea</td>
<td>a lichen (Stereocaulon sp.) with erect, branching stalks</td>
</tr>
<tr>
<td>limu holo `a wai</td>
<td>a freshwater moss</td>
</tr>
<tr>
<td>limu kaha</td>
<td>a kind of liverwort</td>
</tr>
<tr>
<td>limu kala maka pi`i</td>
<td>same as kala maka pi`i</td>
</tr>
<tr>
<td>limu kale maka pi`i</td>
<td>same as kale maka pi`i</td>
</tr>
<tr>
<td>limu kau lā`au</td>
<td>all tiny ferns (filmy ferns), lichens, liverworts, mosses growing on trees</td>
</tr>
<tr>
<td>limu kele</td>
<td>moss growing on trees in rainforest</td>
</tr>
<tr>
<td>limu mā kole maka <code>ō pi</code>i</td>
<td>same as mākole mākō pi`i</td>
</tr>
<tr>
<td>limu pepei ao</td>
<td>same as lī pepei ao</td>
</tr>
<tr>
<td>maka <code>ō pi</code>i</td>
<td>same as mākole mākō pi`i</td>
</tr>
<tr>
<td>mākō pi`i</td>
<td>moss general term</td>
</tr>
<tr>
<td>mākō pi<code>i </code>elenahu</td>
<td>peatmoss</td>
</tr>
<tr>
<td>mākole mākō pi`i</td>
<td>a native moss (<em>Thuidium hawaiiense</em>), the branches on one plane looking like small ferns. See mākō pi<code>i, maka </code>ō pi`i</td>
</tr>
<tr>
<td>`oau</td>
<td>a moss</td>
</tr>
<tr>
<td>`onohī awa</td>
<td>a black moss found in freshwater. Lit. eyeball of the fish awa.</td>
</tr>
<tr>
<td>`opulepule</td>
<td>a spotted land moss</td>
</tr>
<tr>
<td>`owau</td>
<td>same as `oau</td>
</tr>
</tbody>
</table>
Management Concerns

Alien species

The very dense growth exhibited by two alien species in the park, *Pseudoscleropodium purum* and *Hypnum plumaeforme*, strongly suggests they displace native bryophytes along roads and trails. Both species are already widespread along park roads and trails so park-wide removal is unlikely. Neither species produces spores or other wind dispersed propagules and instead are spread by human or animal activity. Efforts should be made to reduce their accidental spread by staff and visitors. For example, mowing equipment should be thoroughly cleaned before transport to job sites not yet invaded by alien moss otherwise small fragments of both moss species clinging to the equipment can easily fall off during equipment operation and grow vegetatively on any damp substrate.

High traffic centers such as the Resources Management field station should be cleared of alien mosses to reduce accidental transport by park vehicles. Special effort should be made to prevent the introduction of *P. purum* into the Kahuku unit and to prevent the introduction of *H. plumaeforme* into the western side of the Kahuku unit. *P. purum* is also growing successfully in the Kipuka Puaulu forest well beyond the trail sides. *P. purum* should be controlled at Kipuka Puaulu where it is growing under the forest beyond the trail sides to prevent potential problems with seedling recruitment and prevent total replacement of the original native terrestrial bryophyte layer which may have unknown consequences for tree fern and seedling recruitment. Both *P. purum* and *H. plumaeforme* should be controlled at Thurston Lava Tube and Kilauea Iki Trail to maintain an easily accessible example of a diverse Hawaiian bryophyte community for public enjoyment and education. Mosses grow slowly compared to vascular plants such that even one or two days of work by a group of volunteers a year might be enough to stop the increase in alien moss cover at Kipuka Puaulu, Thurston Lava Tube, and Kilauea Iki. Because *Breutelia arundinifolia* is not found in natural habitats in the park it should be treated as an alien species and controlled in high traffic sites such as the Kilauea Visitor Center and the Resource Management field station areas to prevent accidental spread further along the park’s roads and trails. *Sphagnum palustre* should be monitored to see if it starts increasing in abundance anywhere in or near the park. *S. subpinnatum* spreads by spores and is consequently now too widespread to possibly control. Roadsides and lawns in Volcano Village should be monitored every few years to watch for the appearance of new alien species that may come in with horticultural plantings. The State of Hawaii should be encouraged to ban the importation of live bryophyte material to prevent the introduction of potentially invasive mosses.

Rare species

In general, too little is known about the population sizes of uncommon moss to accurately assess their risk of extinction. This is true both locally and internationally. The online database of worldwide IUCN Red List of Threatened Species includes 39 moss species currently threatened with extinction (http://www.redlist.org accessed November 3, 2005). None of the listed species are found in HAVO. However, as discussed by the IUCN Bryophyte Specialist Group, the list is admittedly incomplete because so little is known about the actual distribution and population numbers of the world’s moss species.
It could be argued that at least one species in the park, *Scopelophila infericola*, should be considered a critically endangered species because of its extremely narrow distribution limited to only sulfurous steam vents at Sulphur Banks. On the other hand, a taxonomic review of this species could very well find that it should be considered an isolated population of the more widespread *S. ligulata*.

Species that have not been collected for many years such as *Breutelia affinis* are probably very rare. However, in some cases they may be simply difficult to find because they are so small or difficult to distinguish from other, more common species.

**Education**

High rainfall and diverse microhabitats, such as Thurston Lava Tube Trail, support a high diversity of mosses in a relatively small area. The accessibility and high use of this area makes it an ideal place to introduce park visitors to a wide range of relatively large and easily identifiable mosses and their role in the ecological community.

**Acknowledgements**

This inventory was supported by the National Park Service through the Resources Management Division at Hawaii Volcanoes National Park (HAVO) and the Pacific Island Network Inventory and Monitoring program. I am particularly appreciative of the encouragement of the Chief of Resources Management at HAVO, T. Tunison. The assistance of J. Moniz-Nakamura with access to the important cave habitats was appreciated as was the assistance of S. Roper, D. Hu, K. Sherry, R. Swift, K. Magnacca, T. Belfield, and K. Postelli. The assistance of Linda Pratt and David Foote with access to microscope equipment and herbarium material was much appreciated. Bill Halliday and Harry Shick were very kind to share their time and enthusiasm in showing me the steam caves of Kilauea. Access to Bishop Museum data and specimens was possible through the kind assistance of C. Puttock and N. Harbottle. David Webb at the University of Hawaii Department of Botany gave me a lot of help in access to microscopes and microscopy techniques. The valuable comments of B. Stone, L. Sack, K. Schlappa, and C. Smith during the preparation of this manuscript were very useful. This project was carried out under a cooperative agreement with the University of Hawaii at Manoa; David Duffy was serving as the principal investigator.
LITERATURE CITED


Hua`oelelo, K., H. Kuamo`o, and A. Punana Leo. 2003. Māmaka kaiao: a modern Hawaiian vocabulary : a compilation of Hawaiian words that have been created, collected, and approved by the Hawaiian Lexicon Committee from 1987 through 2000. University of Hawai`i Press, Honolulu.


APPENDIX I: CHECKLIST OF THE MOSSES OF HAWAII VOLCANOES NATIONAL PARK

Currently accepted names are listed in bold italic type followed by recently used synonyms, primarily since Bartram (1933), in smaller italic type. Determination of status (endemic, indigenous, or alien) and distribution in Hawaii follows Staples, et al. (2004) except where noted. Endemic refers to a species whose natural range is limited to the Hawaiian Islands, indigenous refers to a species whose natural range includes both the Hawaiian Islands and elsewhere, and alien refers to a species whose natural range does not include the Hawaiian Islands and which arrived in Hawaii via human transport. Status data may be different in NPSpecies than in the checklist below, because NPSpecies uses slightly different definitions. Known distribution within the Hawaiian Islands is listed with the abbreviations K=Kauai, O=Oahu, Mo=Molokai, L=Lanai, Ma=Maui, and H=Hawaii Island. Abundance of each species within HAVO, using the abundance terms defined in NPSpecies (see table below), was estimated based on the author’s experience in the field. Specimens from the HAVO Herbarium (HAVO) or the Bishop Museum Herbarium (BISH) examined to verify identification are listed last. Only representative specimens are listed for species having an unwieldy abundance of herbarium specimens.

NPSpecies abundance terms

<table>
<thead>
<tr>
<th>Abundant</th>
<th>Large number of individuals; wide ecological amplitude or occurring in habitats covering a large portion of the park.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common</td>
<td>Large numbers of individuals predictably occurring in commonly encountered habitats but not those covering a large portion of the park.</td>
</tr>
<tr>
<td>Uncommon</td>
<td>Few to moderate numbers of individuals; occurring either sporadically in commonly encountered habitats or in uncommon habitats.</td>
</tr>
<tr>
<td>Rare</td>
<td>Few individuals, usually restricted to small areas of rare habitat.</td>
</tr>
</tbody>
</table>

Acroporium fuscoflavum (C. Müller) Brotherus, 1925
   Endemic. K, O, Mo, L, Ma, H.
   Abundant. In wet forests on trees and logs.
   Representative specimens examined: Cuddihy 1742; Higashino & Katahira 9990, 9973 (HAVO).

Aerobryopsis subdivergens ssp. scariosa (E.B. Bartram) Nog.
   Aerobryopsis scariosa Bartr. 1939
   Uncommon. In wet forests on humus and logs.
   Specimens examined: Hoe 662.0, 1501.0 (BISH); Skottsberg 2010, 2028 (BISH); Waite 040622-03, 040710-z-01 (HAVO).
**Amphidium tortuosum** (Hornschuch) Cufodontis, 1951
*Amphidium cyathicarpum* (Montagne) Brotherus, 1902
*Grimmia haleakalae* Reichardt, 1877

Indigenous. Ma, H.
Uncommon. Frequent on wet rock in high elevation lava tube entrances of Mauna Loa.
Representative specimens examined: L.W. Cuddihy s.n. (HAVO); Waite 040617-06e, 040619-04-04, 040703-07-03, 040714-05a-7, 040715-03-03 (HAVO)

**Andreaea acutifolia** J. D. Hooker & Wilson, 1844

Indigenous. Ma, H.
Unknown abundance. On rock at high altitude.
Notes: Vitt & Hoe (1980) first report this species in Hawaii based on specimens from Haleakala and Mauna Kea.
Specimens examined: Waite 040714-06-08 (HAVO).

**Anoectangium aestivum** (Hedwig) Mitten, 1869
*Anoectangium euchloron*

Indigenous. K, O, Mo, L, Ma, H.
Common. Locally abundant on shaded, wet rock in lava tube tubes and lava cracks.
Representative specimens examined: Weber & Bujakiewicz B-81931; Waite 040608-17a-1, 040702-04b, 040703-07-04, 040703-09-04, 040715-03-01, 040715-06-11 (HAVO)

**Anoectangium haleakalae** (C. Müller) Paris, 1900

Endemic. K, O, Mo, Ma, H.
Uncommon. Usually intermixed with *A. aestivum* in wetter cave entrances and rocky cliffs.
Notes: Zander, et al. (1979) sunk *A. haleakalae* into *A. aestivum*. However, *A. haleakalae* is in the current list of world-wide accepted moss species (Magil et al. 2000 online at www.mobot.org).
Specimens examined: Waite 040605-09, 040605-12a, 040617-3f, 040710-z-02, 040714-05a5 (HAVO).

**Baldwiniella kealeensis** (Reichardt) E. B. Bartram, 1933
*Baldwiniella kealeensis* (Reichardt) E. B. Bartram, 1933

Endemic. K, O, Mo, L, Ma, H.
Common. In very wet, shaded microhabitats such as on the forest floor in Olaa Tract and lava tube entrances in wet forest.
Specimens examined: Weber & Bujakiewicz B-81933, B-81965 (BISH & HAVO); Cuddihy s.n.; Waite s.n. (HAVO).

**Barbellopsis trichophora** (Montagne) W. R. Buck, 1998
*Barbella trichophora* (Montagne) Fleischer 1906

Endemic. K, O, Mo, Ma, H.
Uncommon. On trees in mesic to wet forest
Specimens examined: Selling, O. 4694 (BISH); Waite s.n. (HAVO).
**Brachymenium exile** (Dozy & Molkenboer) Bosch & Sande Lacoste, 1860
Indigenous. K, O, Mo, Ma, H.
Common. Locally abundant on exposed ash soil.
Specimens examined: Waite 040607-24, 040607-36a, 040608-02h-1, 040703-01 (HAVO).

**Brachythecium hawaiicum** E. B. Bartram, 1939
Endemic. Ma, H.
Unknown abundance.
Specimens examined: None.

**Brachythecium lamprocarpum** (C. Müller) Jaeger, 1878
Indigenous. K, Ma, H.
Uncommon. On shaded rock or humus. Sometimes abundant in cave entrances.
Specimens examined: Winona Char s.n.; Waite 040608-17b-3.1, 040617-07-05, 040619-04-01, 040715-06-01 (HAVO);

**Brachythecium plumosum** (Hedwig) W. P. Schimper in B.S.G., 1853
**Brachythecium oxyrrhynchium** (Dozy & Molkenboer) Jaeger, 1876-1877
Indigenous. K, O, Mo, Ma, H.
Unknown abundance. On shaded damp soil.
Specimens examined: Waite 040702-02-09(HAVO).

**Breutelia affinis** (W. J. Hooker) Mitten, 1856
**Breutelia kilaueae** (C. Müller) Brotherus, 1904
Indigenous. H.
Rare or extinct. Not collected in the Hawaiian Islands since the first specimen was collected from Kilauea, Island of Hawaii (Virtanen, 1997).
Specimens examined: None.

**Breutelia arundinifolia** (Duby in Moritzi) Fleischer, 1904
Indigenous or possibly misidentified alien. K, O, Ma, H.
Uncommon. Locally abundant along roadsides near Kilauea Visitor Center and the Resources Management field station and likely to spread further along roadsides in the wetter parts of the park.
Specimens examined: Hoe 1623.0 from Volcano Village (BISH): Waite 040622-01 (HAVO).

**Bryum argenteum** Hedwig var. lanatum (Palisot de Beauvois) 1839
Indigenous. K, O, Ma, H.
Common. Locally abundant on ash soil or rock. Only rarely with sporophytes.
Specimens examined: Cuddihy s.n.; Waite 040607-35, 040619-05-03, 040712-03-01, 040715-06-07 (HAVO).

**Bryum atrovirens** Bridel, 1803
**Bryum erythrocarpum** Schwaeigrichen, 1816
Indigenous. O, Ma, H.
Uncommon. Possibly more common but easily overlooked because of its small size. On shaded rock in dry habitats.
Specimens examined: Cuddihy 1606, Cuddihy 1585; Waite 040703-09-07, 040722-B-03 (HAVO).
**Bryum caespiticium** Hedwig, 1801
Indigenous. Ma, H.
Unknown abundance. Easily overlooked because of its small size. On exposed soil or rock.
Specimens examined: Waite 040722-A-02 (HAVO).

**Bryum hawaiicum** Hoe, 1974
*Bryum crassicostatum* Brotherus, 1927
Indigenous (Redfearn et al. (1996) extend the range of this species to China). Ma, H.
Common. Easily overlooked because of its small size. On exposed humus or soil.
Specimens examined: Hoe s.n.; Cuddihy 1618; Waite 040608-02h-4, 040608-03a, 040617-05-02 (HAVO).

**Buckiella draytonii** (Sullivant) Ireland
*Catagonium draytonii*
*Hypnum draytonii* Sullivant, 1854
*Hypnum eudorae* Sullivant, 1854
*Plagiothecium draytonii* (Sullivant) E. B. Bartram, 1933
Endemic. K, O, Mo, Ma, H.
Uncommon. In shaded wet forest habitats.
Specimens examined: L.W. Pratt s.n.; Higashino 9900; Weber & Bujakiewicz B-81952 (HAVO).

**Calymperes tenerum** C. Müller, 1872
Indigenous. K, O, Mo, Ma, H.
Unknown abundance. Collected by Hoe from area along the Kalapana Highway just outside the park now covered by lava. Probably still extant in forested low elevation kipukas. On shaded rocks and branches.
Specimens examined: None.

**Campylopodium medium** (Duby in Moritzi) Giese & Frahm, 1985
*Campylopodium euphorocladium* (C. Müller) Bescherelle, 1873
Indigenous. K, O, Mo, Ma, H.
Unknown abundance. Easily confused with *Campylopus* species on humus and tree trunks in wet forests.
Specimens examined: Weber & Bujakiewicz B-81910; Winona Char s.n. (HAVO).

**Campylopus exasperatus** (Nees & Blume) Bridel, 1826
Endemic. K, O, L, Ma, H
Abundant. On exposed rock or soil especially in dry areas but frequent along roadsides in wet areas.
Representative specimens examined: Hoe 1252; Higashino & Muller 9870; Cuddihy 1617; Waite 040608-18a, 040617-08, 040624-01-04, 040720-09-02, 040721-01-02 (HAVO).

**Campylopus fragilis** ssp. *zollingerianus*
*Campylopus boswellii*
Indigenous. K, O, Mo, Ma
Unknown abundance.
Specimens examined: Weber & Bujakiewicz B-81921; Waite 040620-07-02, 040624-01-01(HAVO).
Campylopus hawaiicus var. densifolius (Ångström) Frahm, 1978
Campylopus densifolius var. densifolius Ångström, 1872
   Endemic. K, O, Mo, Ma, H.
   Abundant. On tree trunks, humus, and shaded rocks in mesic to wet forests.
   Representative specimens examined: Weber & Bujakiewicz B-81907; Waite 040607-04a, 040607-25, 040607-30a (HAVO).

Campylopus hawaiicus var. hawaiico-flexuosus (C. Müller) Frahm, 1978
Campylopus densifolius var. hawaiico-flexuosus
Campylopus hawaiico-flexuosus (C. Müller) Paris, 1900
   Endemic. K, O, Mo, L, Ma, H.
   Abundant. On tree trunks and humus in mesic to wet forests.
   Specimens examined: Weber & Bujakiewicz B-81938, B-81967; Higashino & Muller 9852; Waite 040607-11a, 040616-02, 040710-x-01 (HAVO).

Campylopus hawaiicus (C. Müller) Jaeger, 1872 var. hawaiicus
Campylopus densifolius var. purpureo-flavescens
Campylopus purpureo-flavescens Hampe, in herbaria
   Indigenous. K, O, Mo, L, Ma, H.
   Abundant. On tree trunks and humus in mesic to wet forests.
   Specimens examined: Waite 040609-02b, 040710-y-05, 040719-03, 040720-08 (HAVO).

Campylopus latitextus Sande Lacoste, 1872
Campylopus fumarioli C. Mull., 1900
   Indigenous. K, O, Mo, L, Ma, H.
   Unknown abundance.
   Specimens examined: None.

Campylopus praemorsus (C. Müller) Jaeger, 1872
   Endemic. K, O, L, Ma, H.
   Unknown abundance. Very similar in appearance to C. exasperatus.
   Specimens examined: None.

Campylopus schmidii ssp. schimidii (C. Müller) Jaeger, 1872
Campylopus aureus Bosch & Sande Lac, 1858
Campylopus introflexus misapplied
Campylopus polytrichoides misapplied
   Indigenous. K, O, Ma, H.
   Abundant. Abundant on exposed soil between 1500-2100 m (5000-7000 ft.) elevation.
   Representative specimens examined: Weber & Bujakiewicz B-81895; W.J. Hoe 1261; Winona Char s.n.; T. Bellfield s.n.; Waite 040624-08-02, 040702-02-05, 040702-07a (HAVO).

Campylopus umbellatus (Schwägrichen & Gaudichaud ex Arnott) Paris, 1894
   Indigenous. K, O, L, Ma, H.
   Abundant. On exposed rock or soil in dry to wet locations.
   Representative specimens examined: Waite 040608-06b, 040620-06-05, 040710-03 (HAVO).
Campylopus wheeleri (C. Müller) Hampe ex Paris, 1900
_Dicranoloma wheeleri_ (C. Mull.) Par. 1904
Endemic. K, Ma, H.
Unknown abundance. This is recorded from the park based on a single specimen at BISH.
Specimens examined: None.

Ceratodon purpureus (Hedwig) Bridel, 1826
Indigenous. Distribution: K, O, Ma, H.
Abundant. Usually on exposed ash soil and rock but also in cave entrances at higher elevations.
Representative specimens examined: Hoe s.n.; MacDonald s.n.; Smathers s.n.; Waite 040605-03, 040702-07c, 040714-06-09, 040715-06-04, 040718-03-04, 040722-B-01 (HAVO).

Ctenidium elegantulum Brotherus, 1927
Endemic. O, Ma, H.
Unknown abundance.
Specimens examined: None.

Dicranella hawaiica (C. Müller) Brotherus, 1901
Unknown abundance.
Specimens examined: Cuddihy s.n.; Waite 040718-07c-02, 040725-11-02 (HAVO).

Dicranella integrifolia E. B. Bartram, 1933
Endemic. O, Mo, Ma, H.
Abundant. On exposed ash soil.
Representative specimens examined: Hoe s.n., Weber & Bujakiewicz B-81919; Waite 040624-08-06, 040702-02-06, 040718-03-03, 040718-07a, 040718-08 (HAVO).

Dicranodontium porodictyon Cardot & Thériot, 1911
_Dicranodontium falcatum_ Brotherus, 1927
Indigenous. K, O, Mo, Ma, H.
Uncommon. On humus and tree trunks in wet forest.
Specimens examined: Higashino & Allen 10179; Waite 040710-z-04 (HAVO).

Dicranum speirophyllum Montagne, 1843
Endemic. K, O, Mo, Ma, H.
Common. On humus and logs in mesic to wet vegetation.
Representative specimens examined: Higashino & Allen 10187; Hoe 1256; Weber & Bujakiewicz B-81923; Waite 040607-40, 040608-02a, 040702-04f (HAVO).
**Didymodon insulanus** (De Not.) M.O. Hill
*Barbula vinealis* var. *flaccida* B.S.G., 1842
*Barbula vinealis* Bridel ssp. *cylindrica* (Taylor) Boulay, 1884
*Didymodon vinealis* var. *flaccidus* (Brach. & Schimp.) RH Zander

Unknown abundance. On soil and rock.
Specimens examined: Weber & Bujakiewicz B-81899, B-81900; Waite 040608-16a, 040715-03-02 (HAVO).

**Didymodon vinealis** (Bridel) Zander, 1978
*Barbula vinealis*

Indigenous. H (this report)
Unknown abundance. On soil.
Notes: *D. vinealis*, in its current circumscription, is a new record for the Hawaiian Islands. Old concepts of *D. vinealis* included a taxon already recorded from the Hawaiian Islands as a variety but now classified as the separate species *D. insulanus*.
Specimens examined: Waite 040702-02-07, 040703-09-03 (HAVO).

**Distichophyllum freycinetii** (Schwägrichen) Mitten in Seemann, 1873
Endemic. K, O, Mo, L, Ma, H.
Common. On wet soil or humus in understory of wet forests.
Representative specimens examined: Weber & Bujakiewicz B-81989; Higashino 9894, 9899; Waite s.n. (HAVO).

**Distichophyllum paradoxum** (Montagne in Gaudichaud) Mitten in Seemann, 1873
Endemic. K, O, Mo, L, Ma, H.
Common. On wet soil or humus in understory of wet forests.
Specimens examined: Cuddihy 1741; Higashino & Katahira 9987; Weber & Bujakiewicz B-81947; Waite s.n., 040725-08a-03 (HAVO).

**Ectropothecium arcuratum** Mitten in Seemann, 1873
Endemic. K, O, Ma, H.
Unknown abundance.
Specimens examined: None.

**Ectropothecium decurrens** (Sullivant) Nishimura, 1985
*Ctenidium decurrens* (Sullivant) Brotherus, 1927
Endemic. K, O, Mo, Ma, H.
Common. On humus in partially shaded mesic to wet habitats
Specimens examined: Anonymous 1913; Waite s.n., 040607-01, 040607-12, 040609-02f, 040702-02-01 (HAVO).

**Ectropothecium sandwichense** (W. J. Hooker & Arnott) Mitten in Seemann, 1873
Indigenous. K, O, Mo, L, Ma, H.
Unknown abundance.
Specimens examined: None.
**Entosthodon subintegrus** (Brotherus) H. A. Miller, H. O. Whittier & B. Whittier, 1978

*Funaria subintegra* Brotherus, 1927

Endemic. K, O, Mo, L, Ma, H.
Common. On partially shaded, damp soil.
Specimens examined: Cuddihy 1695; Waite 040702-02-12, 040720-02 (HAVO).

**Fabronia degeneri** E. B. Bartram, 1933

Endemic. O, Mo, H.
Unknown abundance. Common on *Sapindus* trees in Kipuka Puaulu.
Specimens examined: Waite 040718-02-04 (HAVO).

**Fissidens bryoides** Hedwig, 1801

**Fissidens hawaiicus** E. B. Bartram, 1933

**Fissidens insularis** E. B. Bartram 1933

**Fissidens oahuensis** E. B. Bartram 1939

Indigenous. K, O, Mo, L, Ma, H.
Abundant. On damp soil in deep shade such as under logs and in cave entrances.
Representative specimens examined: Weber & Bujakiewicz B-81949; Waite 040608-17b-2, 040617-01a, 040619-04-05, 040715-04-05 (HAVO).

**Fissidens elegans** Bridel, 1806

**Fissidens bishopii** Hoe

**Fissidens baldwinii** Brotherus, 1927

Indigenous. K, O, Mo, L, Ma, H.
Common. On damp soil or rock in deep shade such as in lava tube entrances.
Specimens examined: Waite 040721-01-01, 040722-01 (HAVO).

**Fissidens kilaueae** Hoe & H. Crum, 1971 [1972]

Endemic. K, O, L, Ma, H.
Unknown abundance. Its minute size makes it difficult to locate. Hoe & Crum (1971) described this as new species from hapu’u (*Cibotium*) stipes at Thurston Lava Tube, Hawaii Volcanoes National Park.
Specimens examined: Hoe 1072.0 (HAVO).

**Fissidens lancifolius** E. B. Bartram, 1939

Endemic. K, O, Mo, L, Ma, H.
Unknown abundance. This genus typically inhabits deeply shaded wet environments.
Specimens examined: None.

**Funaria hygrometrica** Hedwig, 1801

Indigenous. O, H.
Unknown abundance. Usually present as a weed on potting media in the green houses at near the Resource Management Field Station. An ephemeral species that usually appears in great numbers on exposed soil in the second year after fires in the park such as at Hilina Pali (CW Smith pers. comm.).
Specimens examined: Waite 040610-01 (HAVO).
**Grimmia longirostris** W. J. Hooker, 1818  
*Grimmia haleakalae* Reichardt, 1877 misapplied

  Indigenous. Ma.  
  Abundant. On exposed rock and soil at higher elevations such as at the top of the Mauna Loa Strip Road.  
  Representative specimens examined: Anonymous s.n.; Waite 040608-13, 040619-02-02, 040714-06-05 (HAVO).

**Grimmia trichophylla** Greville, 1824

  Indigenous. Ma, H.  
  Unknown abundance.  
  Specimens examined: Waite 040619-05-02, 040715-06-03 (HAVO).

**Holomitrium seticalycinum** C. Müller, 1896

  Common. On tree branches in wet forests.  
  Endemic. K, O, Mo, L, Ma, H.  
  Common. On tree branches in wet forests.  
  Specimens examined: Cuddihy 1509; Hoe 1584; Waite 040612-04-04 (HAVO).

**Homaliodendron flabellatum** (Smith) Fleischer, 1906

  Indigenous. K, O, Mo, L, Ma, H.  
  Common. On tree trunks in wet forests.  
  Representative specimens examined: Cuddihy 1562; Higashino & Muller 9866; Weber & Bujakiewicz B-81948; T. Belfield s.n. (HAVO).

**Hookeria acutifolia** W. J. Hooker & Greville, 1825

  Indigenous. O, L, Ma, H.  
  Common. On deeply shaded soil in wet forests.  
  Specimens examined: Weber & Bujakiewicz B-81996; Cuddihy s.n.; Waite s.n. (HAVO).

**Hyophila involuta** (W. J. Hooker) Jaeger, 1873  
*Hyophila dozy-molkenboeri* Fleischer, 1900-1902

  Indigenous. K, O, Mo, Ma, H.  
  Uncommon. Rock walls and trails.  
  Specimens examined: Waite 040720-04-03, 040722-B-04 (HAVO).

**Hypnum plumaeforme** Wilson, 1848

  Alien. O (recent coll. Waite), Mo (recent coll. Stone), Ma, H.  
  Abundant. Invasive along roads, trails, and lawns in wet to mesic areas. Potentially invasive in other open canopy vegetation.  
  Representative specimens examined: Cuddihy s.n.; Weber & Bujakiewicz B-81912; Waite 040702-01a, 040702-02-02, 040717-03, 040718-03-02 (HAVO).

**Isopterygium albescens** (W. J. Hooker in Schwägrichen) Jaeger, 1878

  Indigenous. K, O, Mo, L, Ma, H.  
  Abundant. In wet microhabitats.  
  Representative specimens examined: Cuddihy 1612; Higashino 9897; Smathers s.n.; Waite 040715-03-05, 040717-02, 040718-07c-05 (HAVO).
**Isopterygium vineale** E. B. Bartram, 1933  
Endemic. K, O, Mo, Ma, H.  
Unknown abundance. Only one record from the park.  
Specimens examined: Waite 040620-06-01 (HAVO).

**Leptobryum pyriforme** (Hedwig) Wilson, 1855  
Indigenous. Ma, H.  
Unknown abundance. This species is probably present in the park based on its presence just outside the park. Skottsberg also collected it once from the vicinity of Kilauea (Bartram 1933).  
Specimens examined: Waite 040606-01 from residence in Volcano near park (HAVO).

**Leptodontium flexifolium** (Dickson) Hampe in Lindberg, 1864  
*Leptodontium brevicaule* E. B. Bartram, 1933  
Indigenous. M, H.  
Abundant. On exposed ash soil at higher elevations.  
Representative specimens examined: Winona Char s.n.; Cuddihy s.n.; Waite 040617-05-01, 040619-01-03, 040619-05-06, 040702-07d (HAVO).

**Leucobryum gracile** Sullivant, 1874  
Endemic. K, O, Mo, L, Ma, H.  
Abundant. On humus and tree trunks in mesic to wet forests  
Representative specimens examined: Cuddihy 1633; Weber & Bujakiewicz B-81904; Higashino 9908; Waite 040608-02b-1, 040620-06-02, 040718-07c-04 (HAVO).

**Leucobryum seemannii** Mitten in Seemann, 1873  
*Leucobryum hawaiense* (Reichardt) E.B. Bartram, 1933  
Endemic. K, O, Mo, L, Ma, H.  
Common. On humus and tree trunks in mesic to wet forests.  
Representative specimens examined: Cooper s.n.; Cuddihy 1461; Hoe 1265; Higashino, Cuddihy, Weber, & Bujakiewicz 9875 (HAVO).

**Macrocoma tenue** ssp. *sullivantii* (Mull. Hal.) Vitt  
*Macromitrium intricatum* C. Müller, 1896  
Indigenous. K, O, Mo, Ma, H.  
Unknown abundance. Epiphytic on small trees at the end of Mauna Loa Strip Road.  
Specimens examined: Cuddihy s.n.; Waite 040619-a-01 (HAVO).

**Macromitrium brevisetum** Mitten in Seemann, 1873  
Endemic. K, O, Mo, L, Ma, H.  
Unknown abundance. Collected from Kipuka Puaulu and Kipuka Ki in 1966 by Hoe.  
Specimens examined: None.

**Macromitrium emersulum** C. Müller, 1896  
Endemic. K, O, Mo, L, Ma, H.  
Probably present. This species was collected in 1983 from Kalapana outside the park (HAVO) growing epiphytically on a mango tree trunk.  
Specimens examined: Weber & A. Bujakiewicz B-82000 (HAVO).
Macromitrium microstomum (W. J. Hooker & Greville) Schwägrichen, 1827  
*Macromitrium reinwardtii*  
*Macromitrium owahiense* C. Müller, 1864  
Indigenous. K, O, Mo, L, Ma, H.  
Abundant. On trees in wet forests.  
Specimens examined: L.W. Cuddihy 1601; Hoe 1245; Smathers s.n.; Waite 040612-04-02 (HAVO).

Macromitrium piliferum Schwägrichen, 1826  
Endemic. K, O, Mo, L, Ma, H.  
Abundant. On trees in wet forests.  
Representative specimens examined: Cuddihy 1570, 1431; Hoe 1258; Waite 040608-02d (HAVO).

Orthotrichum diaphanum Schrader ex Bridel, 1801  
Indigenous. M, H.  
Unknown abundance. Epiphytic on trees and shrubs.  
Specimens examined: Hoe 981.0 (BISH).

Orthotrichum hawaiicum C. Müller, 1896  
Endemic. Ma, H.  
Unknown abundance. Epiphytic on trees and shrubs.  
Specimens examined: Hoe 828.1, 836.0 (BISH); Vitt 14955, 14956 (BISH).

Orthotrichum rupestre Schleicher x Schwägrichen, 1816  
*Orthotrichum hillebrandi* C. Müller, 1896  
Indigenous. O, Ma, H.  
Unknown abundance. Epiphytic on trees and shrubs.  
Specimens examined: Hoe 828.0 (BISH).

Palamocladium wilkesianum (Sullivant) C. Müller, 1896  
*Pleuropus wilkesianum* (Sullivant) Brotherus, 1908  
Endemic. K, O, Mo, L, Ma, H.  
Common. In damp, shaded places on humus, tree trunks, and rock. Variable in size and in degree of pitting in the leaf cells. Smaller sized plants with little or no pitting of the leaf cells were once recognized as the distinct variety *P. w. sciuroides*. This form is especially common at Kipuka Paauulu on *Sapindus* trunks.  
Representative specimens examined: Char s.n.; Cuddihy 1728; Weber & Bujakiewicz B-81960; Waite 040607-16, 040607-33, 040619-04-02, 040718-02-02 (HAVO).

Pelekium versicolor (Hornsch. Ex Mull.Hal.) Touw, 2001  
*Thuidium crenulatum* Mitten, 1873  
*Thuidium nanophyllum*  
Indigenous. O, Ma, H.  
Unknown abundance. Very similar in appearance to the abundant *Thuidium cymbifolium*.  
Specimens examined: Char s.n.; Weber & Bujakiewicz B-81961(HAVO).
Philonotis falcata (W. J. Hooker) Mitten, 1859
Unknown abundance.
Specimens examined: Cuddihy 1701; Waite s.n. (HAVO).

Philonotis hawaica (C. Müller) Brotherus, 1904
Endemic. K, O, Mo, L, Ma, H.
Unknown abundance.
Specimens examined: Waite (HAVO).

Philonotis turneriana var. sullivantii (C. Müller) Bartram, 1933
Bartramia sullivantii C. Muller, 1896
Endemic. O, Ma, H.
Unknown abundance.
Specimens examined: Cuddihy 1608 (HAVO).

Philonotis turneriana var. turneriana (Schwägrichen) Mitten, 1859
Indigenous. K, O, Mo, L, Ma, H.
Common. On damp soil and humus.
Specimens examined: Waite 040718-03-01 (HAVO).

Phyllodon lingulatus (Cardot) W.R. Buck, 1987
Glossadelphus baldwini Brotherus, 1927
Glossadelphus laevisolius (Mitt.) Bartr.
Taxiphyllum laevifolium (Mitten) W. R. Buck, 1987 misapplied
Indigenous. K, O, Mo, Ma, H.
Unknown abundance. On wet soil or rock in shaded places.
Specimens examined: Higashino & Katahira 9952 (HAVO).

Plagiomnium rhynchophorum (W. J. Hooker) T. Koponen, 1971
Plagiomnium rostratum (Schrader) T. Koponen, 1968 misapplied
Mnium rostratum Schwägrichen, 1816 misapplied
Indigenous. K, O, Mo, Ma, H.
Common. On deeply shaded wet soil, humus, or rock.
Specimens examined: Cuddihy 1552; Weber & Bujakiewicz B-81995; Higashino, Cuddihy, Weber, & Bujakiewicz 9877 (HAVO).

Pogonatum tahitense W. P. Schimper in Bescherelle, 1894
Pogonatum baldwinii (C. Müller) Paris, 1898
Indigenous. K, O, Mo, L, Ma, H.
Common. On wet soil banks.
Specimens examined: Higashino & Katahira 9979; Higashino & Muller 9869; Higashino, Cuddihy, Weber, & Bujakiewicz 9874; Cuddihy s.n.; Waite 040702-02-08 (HAVO).
**Pohlia flexuosa** W.J. Hooker 1836
*Pohlia leucostoma* (Bosch & Sande Lacoste) Fleischer, 1904
*Webera leucostomoides* Brotherus, 1927
*Webera gracilescens* E.B. Bartram, 1933
   Indigenous. K, O, Mo, Ma, H.
   Unknown abundance.
   Specimens examined: Weber &. Bujakiewicz B-81905; Waite 040617-03g (HAVO).

**Polytrichum commune** Hedwig, 1801
   Alien. H.
   Common. On exposed soil along roadsides and in the shrub lands between Kilauea Military Camp and the Hawaiian Volcano Observatory. Extremely abundant outside the park along Highway 11 in Glenwood.
   Specimens examined: Waite 040605-12b, 040624-08-04 (HAVO).

**Polytrichum piliferum** Hedwig, 1801
   Indigenous. Ma, H.
   Unknown abundance. On exposed soil.
   Specimens examined: Waite 040702-07e (HAVO).

**Pseudoscleropodium purum** (Hedwig) Fleischer in Brotherus, 1925
*Scleropodium purum* (Hedwig)
   Alien. H.
   Common. Locally abundant along roadsides and lawns and in the Kipuka Puauulu forest.
   Representative specimens examined: Weber & Bujakiewicz B-81962, B-81924 (HAVO); Vitt 15087 (BISH); Waite 040605-05, 040605-11, 040620-01-01 (HAVO).

**Pseudosymblepharis angustata** (Mitten) Hilpert, 1933
*Pseudosymblepharis mauiensis* (C. Müller) Brotherus, 1927
   Indigenous. K, O, Mo, Ma, H.
   Uncommon. Locally common to abundant on the wet cliff walls of Olaa Trench.
   Specimens examined: Jacobi s.n.; Waite 040710-y-02 (HAVO).

**Pyrrhobryum pungens** (Sullivant) Mitten, 1868
*Rhizogonium pungens* Sullivant, 1854
   Endemic. K, O, Mo, L, Ma, H.
   Unknown abundance. This is an uncertain species for the park because specimens identified as this species in the past are not typical *P. pungens* and instead intermediate in form between *P. spiniforme* and *P. pungens*. The leaf blades of typical *P. pungens* end more or less abruptly near the base of the leaf while the blades of typical *P. spiniforme* are relatively broad from the base all the way to the tip of the leaf. *P. pungens* is also usually larger than *P. spiniforme*. The *P. pungens* identified from the park are large but have leaf blades that, although very narrow, extend all the way to the tip of the leaf.
**Pyrrhobryum spiniforme** (Hedwig) Mitten, 1868  
*Rhizogonium spiniforme* (Hedwig) Bruch, 1846  
Indigenous. K, O, Mo, L, Ma, H.  
Abundant. Widespread on humus and tree trunks in wet forests.  
Representative specimens examined: Weber & Bujakiewicz B-81935; Higashino & Muller 9847; Waite 040607-06 (HAVO).

**Racomitrium crispulum** (J. D. Hooker & Wilson) J. D. Hooker & Wilson, 1854  
Indigenous. K, Ma, H.  
Unknown abundance. Reported from the vicinity of Kilauea, Hawaii Island, based on one specimen collected by Lieutenant Hinds (Bartram, 1933).  
Specimens examined: None.

**Racomitrium lanuginosum** var. *lanuginosum* (Hedwig) Bridel, 1819 [1818]  
*Racomitrium lanuginosum* var. *pruinosum* misapplied  
Indigenous. K, O, Mo, Ma, H.  
Abundant. Abundant on lava rock especially at higher elevations above 1500 m (5000 ft.)  
Note: Vitt & Marsh (1988) revised *Ramomitrium lanuginosum* and *R. pruinosum* and determined that all *R. lanuginosum* and *R. pruinosum* in Hawaii were *R. lanuginosum* var. *lanuginosum*, that specimens previously identified as *R. pruinosum* were in fact misidentified variable *R. lanuginosum*.  
Representative specimens examined: Cuddihy 1602, Higashino & Katahira 9976; Fagerlund & Mitchell 70; Waite 040607-14, 040624-08-01, 040702-04a, 040713-05-01 (HAVO).

**Racopilum cuspidigerum** (Schwägrichen in Gaudichaud in Freycinet) Ångström, 1872  
*Rhacopilum cuspidigerum* (Schwägrichen in Gaudichaud in Freycinet) Ångström, 1872  
Indigenous. K, O, Mo, L, Ma, H.  
Abundant. On soil, rock, or bark in mesic to wet forest.  
Representative specimens examined: Cuddihy 1609: Higashino & Katahira 9973; Belfield/LG 32; Waite 040607-32b, 040718-02-03 (HAVO).

**Radulina hamata** (Dozy & Molkenboer) W. R. Buck & B. C. Tan, 1989 [1990]  
*Trichosteleum hamatum* (Dozy & Molkenboer) Jaeger, 1876-1877  
Indigenous. K, O, Mo, L, Ma, H.  
Common. On humus and tree trunks in wet forests.  
Specimens examined: Cuddihy 1565; Higashino & Katahira 9948; Waite 040616-01 (HAVO).

**Rhynchostegium celebicum** (Sande Lacoste) Jaeger, 1878  
*Eurhynchium celebicum* (Lacoste) E.B. Bartram, 1933  
Indigenous. K, O, Mo, Ma, H (this study).  
Unknown abundance. In wet forest.  
Specimens examined: Weber & Bujakiewicz B-81908 (HAVO).

**Rhynchostegium selaginellifolium** C. Müller, 1896  
*Eurhynchium sellaginellifolium* (C. Müller) E.B. Bartram, 1933  
Endemic. K, O, Mo, Ma, H.  
Unknown abundance. In wet forest.  
Specimens examined: Cuddihy s.n. (HAVO).
**Rosulabryum** borrhari (Schwägrichen) Spence, 1996

*Bryum borrhari* Schwägrichen, 1816

*Bryum decaisnei* Dozy &Molkenboer, 1845

Indigenous. O, Ma, H.

Unknown abundance. Collected twice in 1966 by Bill Hoe from the Mauna Loa Trail.

Specimens examined: None.

**Rosulabryum capillare** (Hedwig) Spence, 1996

*Bryum capillare* Hedwig, 1801

*Bryum vino-viride* E. B. Bartram, 1933

Indigenous. K, O, Ma, H.

Uncommon. On soil and rock at higher elevations especially in lava tube entrances.

Representative specimens examined: Waite 040607-38, 040619-04-03, 040703-05-02, 040715-02-01 (HAVO).

**Schizymenium pulvinatum** (C. Müller) A. J. Shaw, 1985

*Mielichhoferia pulvinata* C. Mull. 1896

Endemic. Ma, H.

Uncommon. On soil at higher elevations including in lava tube entrances.

Representative specimens examined: MacDonald s.n.; Waite 040702-04h, 040703-05-05, 040703-07-02, 040714-05b-09 (HAVO).

**Scopelophila infericola** Hoe, 1973

Endemic. H.

Rare. Sulphur Banks on rock and ash substrate is the only locality known to date.

Specimens examined: Siegel s.n. (BISH); Hoe 4852.0 (BISH); Waite 040620-09-01, 040624-10-01, 040624-12-03, 040624-13-07 (HAVO).

**Sematophyllum hawaiiense** (Brotherus) Brotherus, 1925

Indigenous. K, O, L, Ma, H.

Common. Widespread from low to high elevations on shaded soil, rock or bark in mesic to wet vegetation.

Representative specimens examined: Waite 040612-04-01, 040619-03-03, 040717-01, 040722-A-01 (HAVO).

**Sematophyllum subpinnatum** (Brind.) E. Britton

*Acroporium caespitosum* (Hedwig) W. R. Buck, 1983 misapplied

*Sematophyllum caespitosum* (Hedwig.) Mitt. 1869 misapplied

Alien. O, H.

Probably present. On trees and rocks in wet forests

Not collected in the park but abundant in lower elevation wet forests and probably present in the lower elevation forest kipukas in the Kalapana section of the park.

Specimens examined: Waite 040612-07 from Waiakea Forest Reserve, Road B off Stainback Hwy (HAVO).
**Sphagnum palustre** Linnaeus, 1753  
*Sphagnum henryense* misapplied  
Indigenous. O, H.  
Unknown abundance. Recently found in the park’s Kahuku Unit by Thomas Belfield. Also known from two locations near the park in Volcano Village. On humus in wet forest.  
Specimens examined: Will Haines s.n. from Hawaiian Orchid Island Estates; Waite 040722-E-01 from near the Volcano Village Post Office (HAVO).

**Syrrophodon armatus** Mitten, 1864  
*Syrrophodon oahuense* Brotherus, 1927  
Indigenous. O, Ma, H.  
Unknown abundance. On *Pritchardia beccariana* trunks in Olaa Tract.  
Specimens examined: Waite s.n. (HAVO).

**Syrrophodon hawaiicus** C. Müller, 1896  
Endemic. K, O, Mo, Ma, H.  
Unknown abundance. On tree trunks in wet forest.  
Specimens examined: Weber & Bujakiewicz B-81940, B-81941; Waite s.n. (HAVO).

**Syrrophodon prolifer** Schwägrichen, 1827  
*Syrrophodon kilaeae* C. Müller, 1900  
Indigenous. O, Mo, Ma, H.  
Unknown abundance. Specimens from Kilauea, Island of Hawaii were originally described as an endemic species in 1900.  
Specimens examined: None.

**Taxithelium mundulum** (Sullivant) E. B. Bartram, 1933  
Indigenous. K, O, Mo, L, Ma, H.  
Common. On rock and bark in wet to mesic forests.  
Specimens examined: Cuddihy 1727, Cuddihy 1702; Waite 040612-04-03, 040718-01-03 (HAVO).

**Thuidium cymbifolium** (Dozy & Molkenboer) Dozy & Molkenboer, 1865  
*Thuidium hawaiense* Reichardt, 1877  
*Thuidium plicatum* Mitten in Seemann, 1873  
Indigenous. K, O, Mo, L, Ma, H.  
Abundant. On humus, rock, and tree trunks in shaded, wet microhabitats from forest to lava tube entrances.  
Representative specimens examined: Cuddihy 1481; Higashino & Katahira 9972; Hoe 1255; Waite 040607-18b, 040702-02-03, 040702-04d (HAVO).

**Tortella humilis** (Hedwig) Jennings, 1913  
*Tortella caespitosa* (Schwaegrichen) Limpricht, 1888  
Indigenous. K, O, L, Ma, H.  
Unknown abundance. On exposed soil or rock.  
Specimens examined: Cuddihy s.n.; Waite 040617-05-05 (HAVO).
**Trematodon latinervis** C. Müller, 1896
Indigenous. K, O, Mo, Ma, H.
Common on damp, partially shaded soil.
Specimens examined: Higashio & Muller 9870 (HAVO).

**Trichostomum crispulum** Bruch
*Trichostomum bartramii* Mill. 1967
*Trichostomum mauiense* Brotherus, 1927
Indigenous. K, O, Mo, L, Ma, H.
Abundant. On soil, humus, and rock in dry to mesic areas especially on the west side of Kāhuku unit.
Representative specimens examined: Weber & Bujakiewicz B-81915; Hoe s.n., Hoe 1578; Waite 040607-12a, 040607-15, 040607-29b, 040608-05, 040609-01a (HAVO).

**Vesicularia perviridis** (Ångström) C. Müller, 1896
**Vesicularia graminicolor** (Ångström) Brotherus, 1927
**Hookeria sandvicensis** Reichardt, 1877
Endemic. K, O, Mo, L, Ma, H.
Common. On soil and humus in shaded wet microhabitats
Specimens examined: Higashino & Cuddihy 9873; Waite 040722-D-02, 040725-08a-01, 040725-09-01, 040725-11-01 (HAVO).

**Weissia controversa** Hedwig, 1801
**Weissia viridula** Hedwig, 1801
Indigenous. Ni, K, O, H.
Unknown abundance. On soil. Difficult to distinguish from the following *Weissia* species.
Specimens examined: None identified to species.

**Weissia ovalis** (Williams) E.B. Bartram, 1933
Endemic. K, O, Mo, L, Ma, H.
Unknown abundance. On soil. Difficult to distinguish from *W. controversa*.
Specimens examined: Waite 040608-06a (HAVO).

**Zygodon tetragonostomus** A. Braun ex B.S.G., 1838
Indigenous. K, O, Ma, H.
Common. On trees and shrubs an occasionally on shaded rock or soil in mesic to dry vegetation above 1200 m (4000ft).
Representative specimens examined: Char s.n.; Weber & Bujakiewicz B-81898; Waite 040608-19, 040619-03-01, 040619-05-01, 040718-02-01 (HAVO).
Figure A1. *Acroporium fuscoflavum* from Olaa Trench. Leaf microphotograph from Oahu specimen.

Figure A2. *Aerobryopsis subdivergens ssp. scariosa* from Olaa Trench. Leaf microphotograph from Oahu specimen.
Figure A3. *Baldwiniella kealeensis* from Olaa Trench

Figure A4. *Brachymenium exile* with immature sporophytes from West Kahuku and with mature sporophytes from Crater Rim Trail.
Figure A5. *Bryum argenteum* var. *lanatum* from West Kahuku.

Figure A6. *Campylopus umbellatus* from Olaa Trench.
Figure A7. *Dicranum speirophyllum* from West Kahuku.

Figure A8. *Distichophyllum freycinetti* from Thurston Lava Tube area.
Figure A9. *Distichophyllum paradoxum* from Thurston Lava Tube area.

Figure A10. *Leucobryum seemannii* from Thurston Lava Tube area.
Figure A11. *Palamocladium wilkesianum* from West Kahuku.

Figure A12. *Plagiomnium rhynchophorum* from a Mauna Loa lava tube. Leaf microphotograph from Oahu specimen.
Figure A13. *Pogonatum tahitense* from Crater Rim Trail.

Figure A14. *Pseudosymblepharis angustata* from Olaa Trench.
Figure A15. *Pyrrhobryum spiniforme* from Olaa Trench. Leaf microphotograph from Oahu specimen.

Figure A16. *Racomitrium lanuginosum* with sporophytes, West Kahuku.
Figure A17. *Thuidium cymbifolium*. This photograph from plant collected on Oahu