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Sarah J. De Groot
California Botanic Garden, Claremont

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LIST OF BRYOPHYTES COLLECTED IN THE NORTHERN LAST CHANCE RANGE AND EUREKA VALLEY, DEATH VALLEY NATIONAL PARK

SARAH J. DE GROOT1,2

1Rancho Santa Ana Botanic Garden/California Botanic Garden, 1500 North College Avenue, Claremont, California 91711 (xylococcus@gmail.com)
2Current address: 10678 Cerveza Drive, Escondido, California 92026

ABSTRACT

A list of bryophytes occurring naturally in northern Death Valley National Park is presented. So far, 41 taxa have been documented, representing seven families and 24 genera. One species, Jaffueliobryum wrightii, is considered rare by the California Native Plant Society.

Key words: bryophytes, California, Death Valley National Park, Eureka Valley, liverwort, moss, rare plants.

INTRODUCTION

For most plant collectors, bryophytes—including mosses, liverworts, and hornworts—are easily and often overlooked. They tend to be small, lack colorful flowers or bracts, and frequently are tucked away under shrubs or in rock cracks. Even if they are noticed, some collectors are unaware of how to collect useful specimens. As a result, many areas, especially in the California deserts, have very few collections of mosses (James R. Shevock, CAS, pers. comm.).

While working to complete a checklist of vascular plants in the northern Last Chance Range and Eureka Valley, bryophytes were collected opportunistically. Additional information and a map of the study area are provided in the companion paper featuring the annotated checklist of vascular plants (Bell et al. 2021, this issue). Since there are many places where bryophytes could occur throughout the area, and not every habitat was thoroughly searched, this list is not necessarily comprehensive, but is intended to be a useful starting place for further documentation or land management decisions.

METHODS

Bryophyte specimens were collected by the author during 20 field days in 2017–2019 in Eureka Valley and the northern Last Chance Range (roughly the part of the range north of Ubehebe Crater and Marble 7559T). Specimens were sent to California Academy of Sciences (CAS), where they were identified by David Toren and James R. Shevock. Duplicates were retained at California Botanic Garden (RSA). The Consortium of North American Bryophyte Herbaria (https://bryophyteportal.org/portal/, accessed Mar 2021) was searched, and any taxa not collected by the author are included (8 specimens).

RESULTS AND DISCUSSION

In total, 130 specimens were collected. Along with the herbarium specimens, this represented seven families, 24 genera, and 41 species (Tables 1–2). Bryophytes were found in or near seeps, among gravel and pebbles in washes and on slopes, in rock cracks, and on boulder or cliff faces (Fig. 1–6). Many were growing in part or full shade, but a few were found in full sun. They are found at all elevations in the area and in all vegetation types, from creosote bush scrub to pinyon woodland. A list of species is presented in Appendix 1. Habitat information is included, since many bryophytes are specific to certain substrates or microhabitats.

Table 1. Families of bryophytes represented.

<table>
<thead>
<tr>
<th>Family</th>
<th>Number of genera</th>
<th>Number of taxa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pottiaceae</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Bryaceae</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Grimmiaeae</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Funariaceae</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Amblystegiaceae</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Encalypta</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Brachytheciaceae</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2. Ten most speciose bryophyte genera. All other genera were represented by only one species in the area.

<table>
<thead>
<tr>
<th>Genus</th>
<th>Number of taxa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntrichia</td>
<td>6</td>
</tr>
<tr>
<td>Grimmia</td>
<td>4</td>
</tr>
<tr>
<td>Crossidium</td>
<td>3</td>
</tr>
<tr>
<td>Didymodon</td>
<td>2</td>
</tr>
<tr>
<td>Encalypta</td>
<td>2</td>
</tr>
<tr>
<td>Funaria</td>
<td>2</td>
</tr>
<tr>
<td>Gemmabryum</td>
<td>2</td>
</tr>
<tr>
<td>Microbryum</td>
<td>2</td>
</tr>
<tr>
<td>Pterygoneurum</td>
<td>2</td>
</tr>
<tr>
<td>Tortula</td>
<td>2</td>
</tr>
</tbody>
</table>
**EXCLUDED TAXON**

**Dicksonia azorica** E.B. Bartram (Dicksoniaceae) is represented by a single specimen: Last Chance Mountains, east of sand dunes at south end of Eureka Valley, elevation 1219 m (4000 ft), 08 Apr 1955, P. A. Munch 20576, NY. However, this is a Central American species, and would be out of place in arid mountains of the northern Mojave Desert. Therefore it is almost certainly a misidentification (B. Carter, pers. comm., July 2021). It would be useful if the original Munch specimen could be re-determined.

**ACKNOWLEDGEMENTS**

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**LITERATURE CITED**


**APPENDIX I**

A list of bryophyte species is presented, along with microhabitat, substrate information, and the location where a representative voucher was collected. Rock types are from bedrock geologic maps of the area, available on the National Geologic Map Database (2021), particularly McKee (1985), Wrucke and Cornett (1990), and McKee and Nelson (1967). Rarity rankings are from the California Native Plant Society’s Inventory (CNPS 2021), and rare taxa are marked with §. Distances labeled “air” are straight-line distances measured between a collecting site and the point referenced, usually using the GeoLocate Web application (http://www.geolocate.org/web/WebGeoRef.aspx, accessed 2017–2021). Distances denoted “road” or “surface” follow road curves or the courses of washes, measured with a vehicle’s trip odometer (in miles) or using GeoLocate.

**AMBLYSTEGIACEAE**


**Drepanocladus aduncus** (Hedw.) Warnst. Elevation 1734 m (5690 ft). At the open fringes of the spring. South-facing, sedimentary, wet slope. Riparian herbaceous vegetation. Last Chance Spring (main spring above cabin). *Dana York* 2734 (CAS).

**BRACHYTHETIACEAE**


**BRYACEAE**

**Bryum argenteum** Hedw. Elevation 1582–1989 m (5188–6525 ft). Dry to damp sand, gravel and talus in canyon washes and cracks in rock outcrops. Aspect east to south. Quaternary alluvium, Miocene granite, upper Cambrian Dunderberg Shale member or Cambrian Nopah Formation. Desert scrub vegetation. Full sun to part shade. About 0.3 air km (0.2 mi) north of El Capitan mine shaft, ca. 9.0 road km (5.6 mi) north of Crater. *Sarah J. De Groot* 11138 (CAS, RSA).


**Gemmabryum subapiculatum** (Hampe) J.R. Spence & H.P. Ramsay, Elevation 1768 m (5800 ft). In a Joshua tree woodland with *Chrysothamnus*; under fallen branch among willows at spring. Last Chance Range; along Cucumonga Canyon at Willow Spring. *Eve Laeger* 1310 (CAS).


**Roualaria capillare** (Hedw.) J.R. Spence. Elevation 1331 m (4366 ft). Narrow rock canyon at dry waterfall. Nearly vertical rock walls, and talus wash. Facing N15°E. Cambrian Bonanza King formation (marine sedimentary rock: gray limestone). Mojave desert scrub. Infrequent; in damp silty soil and pebbles in small alcove in rock face; more or less full shade. Last Chance Range: side canyon of unnamed canyon south-southeast of Crater, ca. 1.8 surface km (1.1 mi) south of Big Pine–Death Valley Road, along canyon wash. *Sarah J. De Groot* 10790 (CAS, RSA).

**ENCALYPTACEAE**

**Encalyptia intermedia** Juratzka. Elevation 1331–2444 m (4366–8015 ft). Rock outcrops, cliffs, and canyons, sometimes with lichens. Slope from nearly flat to vertical. Aspect varies from east to north to west-facing. Often on limestone or dolomite, but also found on monzonite, shale, alluvium, siltstone, sandstone, or quartzite. Desert scrub to pinyon–juniper–Joshua tree–sagebrush woodland. Rare to frequent, usually in dry cracks in rock outcrops or cliffs, occasionally in damp sand at the base of a cliff. Mostly in part shade, but occasionally in full sun or full shade. Found at many locations in the Last Chance Range. Along ridge south of Last Chance Peak, ca. 1.4 air km (0.9 mi) southeast of White Top 8456T, ca. 0.17 air km southeast of 8250T. *Sarah J. De Groot* 9955 (CAS, RSA).

**Encalyptia vulgaris** Hedw. Elevation 1107–1288 m (3630–4223 ft). Narrow rocky canyons, steep boulder-strewn washes. Slope flat to ca. 40
Funaria hygrometrica Hedw. Elevation 958 m (3141 ft). Alkaline; see pon.

Enosthodon rubrisetus (E.B. Bartram) Grout. Elevation 1148 m (3765 ft). Local aspect S10°E. Narrow canyon with rock walls and steep talus banks. Narrow band of upper Cambrian Dunderberg Shale, surrounded by upper Cambrian Nopah Formation (gray dolomite). Scrub vegetation. Rare, in dry crack in wall of gray-pink limestone rock outcrop. Sun to part shade. Last Chance Range, ca. 0.3 air km (0.2 mi) north of El Capitan mine shaft, ca. 9.0 air km (5.6 mi) north of Crater. Sarah J. De Groot 11136 (CAS, RSA).

Funariaceae


Grimmia anodon Bruch & Schimp. Elevation 1307–2540 m (4287–8331 ft). Many substrates, including limestones, dolomites, chert, shale, monzonte, basalt cinders or flow, Quaternary alluvium, clay, sandstone, siltstone, or quartzite; sometimes with lichen. Desert scrub to pinyon–sagebrush–Joshua tree woodlands. Locally rare to common, in dry cracks on walls of boulders, outcrops, cliffs, or occasionally on thin soil. Sun to part shade. Many locations in the Last Chance Range and northern Eureka Valley. Along ridge south of Last Chance Peak, ca. 1.4 air km (0.9 mi) southeast of White Top 8456 ft, ca. 0.17 air km southeast of 8250 ft, Sarah J. De Groot 9956 (CAS, RSA).


Grimmia moxleyi R.S. Williams. Elevation 1122 m (3680 ft). Canyon, narrow steep rocky wash drainage. Gray, white, and pink limestone outcrops, boulders, talus, and gravel. Slope facing N56°E. Ordovician Ely Springs dolomite. South-facing slope with creosote bush scrub, north-facing slope with Purshia scrub. Common; on dry walls of limestone boulders. Part shade. East slope of Last Chance Range; ca. 3.9 road km (2.4 mi) southeast of Crankshaft Junction, then ca. 0.95 km southwest into canyon. Sarah J. De Groot 10804 (CAS, RSA).


Pottiaceae


Cucomungo Canyon, north side of Willow Creek drainage. Sarah J. De Groot 11109 (CAS, RSA).

Didymodon tophaceus (Brid.) Lisa. Elevation 1401 m (4595 ft). Moss in steep narrow side canyon drainage. Area sloped 15 degrees, facing N10°E. Local aspect of microsite facing N18°W. Gray gravel and talus. Ordovician Pogonip group (gray limestone), surrounded by Quaternary older alluvium. Furnace Creek–Death Valley Fault Zone. Mojave desert scrub. Locally common/abundant, in wet soil in thin soil on rock face with seeping water, and at base of rock face. Full shade to filtered sun. Last Chance Canyon, ca. 7.1 air km (4.4 mi) southeast of Willow Spring, 2.6 air km (1.6 mi) south-southeast of confluence of Last Chance and Copper Canyons, 1.4 air km (0.85 mi) east-northeast of Last Chance Spring. Sarah J. De Groot 11193 (CAS, RSA).

Pottia rubrotincta (Brid.) S. Watson. Elevation 1103 m (3600 ft). Canyon, narrow steep rocky wash drainage. Gray, white, and pink limestone outcrops, boulders, talus, and gravel. Slope facing S10°E. Ordovician Ely Springs dolomite. South-facing slope with creosote bush scrub, north-facing slope with Purshia scrub. Common; on dry walls of limestone boulders. Part shade. East slope of Last Chance Range; ca. 3.9 road km (2.4 mi) southeast of Crankshaft Junction, then ca. 0.96 km southwest into canyon. Sarah J. De Groot 10809 (CAS, RSA).
EUCLADIUM VERTICILLATUM (Bridel) Bruch & Schimp. Elevation 1680 m (5512 ft). Limestone outcrops and gravel; with surface water. Slope 25–30 degrees, facing S42°W. Boundary between Miocene granite (light colored biotite aplite to coarse-grained quartz monzonite) and Upper Cambrian Nopah Formation (light to medium gray limestone, sometime white). Riparian vegetation, surrounded by pinyon–juniper woodland. Occasional, on wet mucky sand and rock. Filtered sun, under Muhlenbergia esperifolia. Northeast Last Chance Range, hillside seep ca. 0.2 air km (0.1 mi) east-southeast of Last Chance Spring. Sarah J. De Groot 11223 (CAS, RSA).

GYMNOSTOMUM CALCAREUM Nees & Hornschuch. Elevation 1122 m (3681 ft). Rocky canyon. Aspect S34°E. Limestone outcrops and talus. Ordovician Palmetto Formation. Mojave desert scrub. Locally frequent; on damp thin silt and rock in alcohole behind dry waterfall. Shade. East slope of Last Chance Range; ca. 3.9 road km (2.4 mi) southeast of Crankshaft Junction, canyon ca. 1.2 air km southwest of Death Valley Road. Sarah J. De Groot 10826 (CAS, RSA).

MICKEYRUM STARECANUM (Hedw.) R.H. Zander [rhizoids bearing distinctive


SYNTRICHIA RURALIS (Hedw.) Web. & Mohr. Elevation 1288–2475 m (4223–8117 ft). Rocky slopes and canyons. Slope 15–20 degrees, facing north to northeast to east. Growing on various rock types: Plocine rhylolite flow, Miocene diorite, Jurassic hornblende-augite monzonite, Cambrian Bonanza King dolomite, upper Cambrian Dunderberg Shale member, or upper Cambrian Nopah Formation (gray dolomite). Mojave desert scrub to pinyon wood. Rarely to locally frequent, on dry sandy soil among pebbles, at bases of boulders, or on rock walls. Full to filtered sun. Canyon draining into the Eureka Valley, ca. 4.0 air km (2.5 mi) northeast of Lime Hill, northeast tip of Inyo Mountains. Sarah J. De Groot 11001 (CAS, RSA).


TORTULA INERMIS Bridel. Elevation 1138–1687 m (3734–5534 ft). Washes, banks, outcrops, and canyons. Slope from about 15–35 degrees, facing southeast, east, northeast, north, to northwest. Growing on various rock types: alluvium, Plocine basalt flow, Miocene or Jurassic granite or monzonite, Ordovician Ely Springs dolomite or Pogonip limestone, Cambrian Bonanza King dolomite or limestone. Mojave desert scrub, Purshia scrub, or Joshua tree woodland. Infrequent to locally frequent, in moist to dry sandy soil or rock faces, sometimes under rock overhangs. Full shade to full sun. Last Chance Range, side canyon of unnamed canyon south-southeast of Crater; ca. 1.8 surface km (1.1 mi) south of Death Valley Road, and canyon wash. Sarah J. De Groot 10788 (CAS, RSA).

TORTULA MUCRONIOLA Schwägr. Elevation 2540 m (8331 ft). White talus slope, ca. 25 degrees, facing N01°E. Upper and middle Cambrian Bonanza King dolomite. Pinyon woodland. Rare or occasional on dry sandy soil between limestone boulders. Mostly in shade. Last Chance Range, north slope of White Top, ca. 0.115 air km north-northeast of White Top 8457. Sarah J. De Groot 9950 (CAS, RSA).

TRICHIOSTOMUM CRISPULUM Bruch. Elevation 1122–1531 m (3681–5021 ft). Rocky canyons and outcrops on slopes. Local aspect southeast, northeast, or northwest. Ordovician Palmetto Formation, Jurassic hornblende-augite monzonite, or Plocine basalt flow. Mojave desert scrub. Occasional to locally common, on damp sand in rock cracks, alcoves, or grottoes. Full shade. Canyon draining into the Eureka Valley, ca. 4.0 air km (2.5 mi) northeast of Lime Hill, northeast tip of Inyo Mountains. Sarah J. De Groot 10993 (CAS, RSA).

WEISSIA LIGULIFOLIA (E.B. Bartram) Grout [= W. andersoniana Zander]. Elevation 1280–1909 m (4200–6525 ft). Slot below dry waterfall, rock outcrops on hillsides, and narrow canyons. Slope to 60 degrees, facing north to northeast, or locally south if rock overhangs provide shade. Cambrian Nopah Formation dolomite, Bonanza King dolomite, or Dunderberg shale. Mojave Desert scrub. Rare to scattered, on dry to moist thin sand in cracks between rocks or on walls. Mostly in full or nearly full shade. Northeast Eureka Valley, just west of the mouth of Cucamonga Canyon, north side of Willow Creek drainage. Sarah J. De Groot 11008 (CAS, RSA).