

New records of Cyperaceae from Hawai'i

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New records of Cyperaceae were found across several islands during both casual botanizing and roadside grass surveys. Six new island records, five new state records, three corrections, and one questionable naturalization are reported. All identifications were made by the author, unless otherwise noted. Voucher collections mentioned are housed in Bishop Museum's Herbarium Pacificum (BISH), Honolulu, Hawai'i.

Cyperus aggregatus (Willd.) Endl.

New island record

Cyperus aggregatus was found during roadside surveys on Moloka'i, where a small patch of less than 10 plants was found along the road entering Hālawā Valley. *Cyperus aggregatus* is now known to be naturalized on Moloka'i and Maui (Starr & Starr 2015).

Material examined. **MOLOKA'I:** Rt 450 at the first switchback as the road enters Hālawā Valley, from roadside gravel in dry, partly sunny area under guard rail, rare, only one small patch seen in this area, 129 m, 21.155263, -156.733633, 29 Dec 2022, K. Faccenda 2956.

Cyperus croceus Vahl

New state record

Cyperus croceus is now known from O'ahu and Hawai'i, where it has been present since at least 2004, except that, until recently, the specimens were misidentified. These misidentified specimens were brought to the attention of Mark Strong (US) who correctly identified them. The population size of the colony on O'ahu is unclear, but on Hawai'i Island about 20–30 plants were seen during roadside surveys in Hawaii Volcanoes National Park in the Volcano Unit. Only scattered plants were seen and the largest population of about a dozen plants was seen at tree molds at the base of Mauna Loa Strip Road. *Cyperus croceus* is native from the United States through Ecuador (POWO 2023). It has also been reported as naturalized in Spain, where it was likely introduced with contaminated grass seed (Verloove & Gullón 2010). It is unclear by what mechanism this species arrived in Hawai'i. *Cyperus croceus* can be identified by its perennial habit; rather dense, hemispherical or subglobose heads (Figure 1); affinity for drier areas than most other *Cyperus* in Hawai'i; and 2–4 flowers per spikelet.

The following description is from Flora of North America Editorial Committee (1993:149):

“Herbs perennial, caespitose. Culms trigonous, (4–)14–45 cm × 1–2 mm, glabrous. Leaves yellow-green, flat, 18–44 cm × 3–4.5 mm. Inflorescences: spikes densely to loosely globose to ovoid, 10–20 mm wide; rays (3–)5–9(–14), 1–15(–26) cm; rachis 3–6(–9) mm; bracts (4–)6–9(–11), horizontal to ascending at 45°, flat, 1–30 cm × 0.5–4 mm; rachilla deciduous, wings persistent, 0.3–0.5(–0.8) mm wide. Spikelets (10–)30–50, oblong to lanceoloid, quadrangular to subterete, compressed, 4–8 × 1–1.3 mm; distal spikelet spreading or ascending; floral scales persistent, (1–)2–4(–6), appressed, whitish with red speckles, laterally 2–4-ribbed, ovate, 2.3–3.6 × 1.8–2.2 mm. Flowers: anthers 0.5 mm; styles 0.6–1.3 mm; stigmas 1.2–2.6 mm. Achenes reddish brown to nearly black, sessile, oblong, ellipsoid, 2–2.4 × 0.4–0.5(–0.7) mm, apex ± truncate-emarginate, apiculate, surfaces punctulate.”



Figure 1. *Cyperus croceus* growing near the backcountry office at Hawaii Volcanoes National Park.

Material examined. **O‘AHU:** Lualualei, back of valley, across from 59th St, southern ridges of Kaua, occasional along ridge, 405 m, 19 Feb 2004, *K.R. Wood 10580*. **HAWAI‘I:** Hawaii Volcanoes National Park, offices near the Visitor Center, moist, sunny roadside, rare in this area, only one clump, achene 1.7 mm, oblong, trigonous, 1207 m, 19.424418, -155.255987, 19 Aug 2022, *K. Faccenda 2676*; Hawaii Volcanoes National Park, along closed road leading to lava viewing area by the park headquarters and area with housing, weedy area, one plant seen, caespitose, 1209 m, 19.425986, -155.257546, 10 Aug 2022, *K. Faccenda 2609*.

***Cyperus cyperinus* (Retz.) Valck.Sur.**

Correction

Cyperus cyperinus is no longer known from O‘ahu, as the sole specimen was reidentified as *Cyperus croceus*. See further notes above.

***Cyperus cyperoides* (L.) Kuntze**

New island record

Cyperus cyperoides is now known from Lāna‘i from one collection of a single plant at Kapukaloa. This species has also been reported from Hawai‘i Island, where it is considered a questionable naturalization (Strong & Wagner 1997).

Material examined. **LĀNA‘I:** Ka‘ā, vicinity of Kapukaloa, single plant, 540 m, northing 2308690, easting 709073, 11 Oct 2013, *H. Oppenheimer et al. H101809*.

***Cyperus flavescens* L.**

New state record

Cyperus flavescens, a globally widespread species, has now made an appearance in Hawai‘i, where it has been found during roadside surveys on Kaua‘i and Hawai‘i. On Kaua‘i, a colony was collected on a roadside in the back of Kapa‘a Valley near the Keāhua



Figure 2. *Cyperus flavescens*, photographed at Keāhua Arboretum.

Arboretum; because it was not recognized at the time as a new record, its population size was not recorded, but it was relatively common. Further populations were observed but not vouchered at Hanalei Valley (22.187725, -159.467229) and Kahiliholo Rd. near Kīlauea (22.205877, -159.429997). Another single plant was found on the side of the road in Honolū‘i on Hawai‘i Island. Examination of the *Cyperus* collection at BISH revealed another specimen—22 years old—documenting *C. flavescens* as naturalized and common on the University of Hawai‘i Hilo campus. This species is an annual and grows on moist to saturated soil, generally in sunny locations. *Cyperus flavescens* can be identified by its annual habit, yellow spikes arranged umbellately (Figure 2), black fruits 1–1.2 mm long, and <30 cm tall habit.

The following description is from Flora of North America Editorial Committee (1993:142):

“Herbs, annual, cespitose. Culms trigonous, (2–)4–30 cm × 0.4–2 mm, glabrous. Leaves 1–5, (blades often absent, base of culm with 1 reddish sheath bearing minute blade tooth 1–2 mm), (3–)10–18 cm × (0.5–)1.5–2(–2.6) mm. Inflorescences: spikes 1–3, ovoid or ± digitate, 10–30 × 8–26 mm; rays 1–4(–6), 0.5–3(–9) cm; bracts 2–3, approximately horizontal, 1–12 cm × 0.5–2.5 mm. Spikelets 1–6, compressed, oblong-lanceoloid, 5–15 × (2–)2.3–2.8 mm; floral scales (4–)8–24, closely imbricate, laterally yellow to yellowish brown, margins light brown to clear, medially green, laterally ribless, medially 2–3-ribbed, 2-keeled basally, ovate, (1.5–)1.8–2.2 × 1.8 mm, apex obtuse. Flowers: stamens 3; anthers 0.4 mm, connectives not prolonged; styles 0.5–1 mm; stigmas 0.5–0.8 mm. Achenes jet black to reddish brown, slightly stipitate, obovoid, 1–1.2 × 0.8 mm, apex apiculate, surface with network of rectangular longitudinally elongate cells and transverse undulations.”

Material examined. **KAUAI:** Kapa'a Valley, Keāhua Arboretum, roadside in the arboretum, from saturated soil of roadside ditch, partly shaded area before crossing over Kāwī Stream, common, 158 m, 22.071789, -159.417147, 29 May 2022, *K. Faccenda 2388*. **HAWAII:** Honoli'i, Kahoa St along Honoli'i Stream, weed on roadside, wet, shady forest, one plant seen, caespitose, 33 m, 19.757840, -155.093914, 14 Aug 2022, *K. Faccenda & M. Murphy 2645*; near UH-Hilo, coming up in waste areas, relatively common, 60 m, 19° 42' N. 155° 05' W, 01 Aug 2001, *F. Starr & K. Martz 010801-12*.

***Cyperus meyenianus* Kunth**

Correction

Cyperus meyenianus is no longer known from Lāna'i, as the sole specimen cited by Oppenheimer & Bogner (2019) has been reidentified as *C. cyperoides*.

***Cyperus papyrus* L.**

New island record

Cyperus papyrus, commonly known as papyrus, has long been naturalized on O'ahu at Kawainui Marsh, but has only recently been collected. Examining historical aerial photographs, it appears that these colonies have existed since before 1990, and have slowly expanded over time (Figure 3), until the largest has reached its current diameter of 84 meters. There are at least 5 colonies in the marsh currently visible from aerial photographs, although not all are visible in Figure 3. Another population exists in a reservoir off of Old Nu'uuanu Pali Rd. *Cyperus papyrus* is now known to be naturalized on Kaua'i, O'ahu, and Hawai'i (Wagner *et al.* 1990; Staples *et al.* 2003).

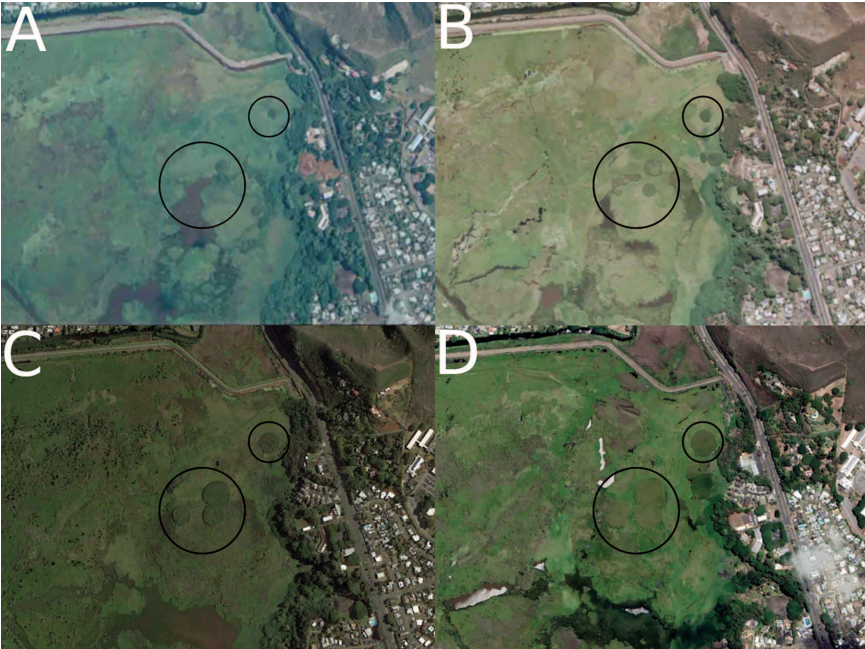


Figure 3. Aerial photographs of four colonies of *Cyperus papyrus* at Kawainui Marsh over 30 years. One colony is present in the smaller circle and three in the larger circle. **A**, two colonies visible in 1993, photo courtesy of NOAA. **B**, three colonies visible in 2000, photo courtesy of NOAA. **C**, four colonies visible in 2013, photo courtesy of Google Earth & Maxar Technologies. **D**, four colonies visible in 2022, photo courtesy of Google Earth & Maxar Technologies.

Material examined. O'AHU: Reservoir off of Old Nu'uuanu Pali Rd near Bureau of Water Supply Pump Station, emergent from mucky silt on reservoir edge, culms triangular, spongy inside, to 3 m tall, very large colony present, 246 m, 21.350226, 157.818772, 09 Jan 2022, *K. Faccenda 2186*; Kawainui Marsh, far east portion of marsh, forming large monocultures in marsh, spreading rhizomatously, these clumps up to ca. 50 m wide, 2 m, 21.390034, -157.749991, 09 Jan 2022, *K. Faccenda 2189*.

Cyperus sphacelatus Rottb.

New island records

Cyperus sphacelatus was found naturalized during roadside surveys on Maui and Hawai'i. On Maui, one individual was found near the Hāna landfill and a population of about 50 plants were found near Kaupō. While botanizing in Hilo, this sedge was found abundantly on roadsides where many thousands of plants were seen, especially around Waiākea. The current distribution of this species on the islands is shown in Figure 4. *Cyperus sphacelatus* was previously reported as naturalized only on Moloka'i (Oppenheimer 2008).

During a nursery survey at Kauai Nursery & Landscaping, a single individual of *C. sphacelatus* was found growing as a weed in a pot. Given that no individuals were found growing in the ground, it cannot be reported as naturalized on the island, but likely is already, or will be soon.

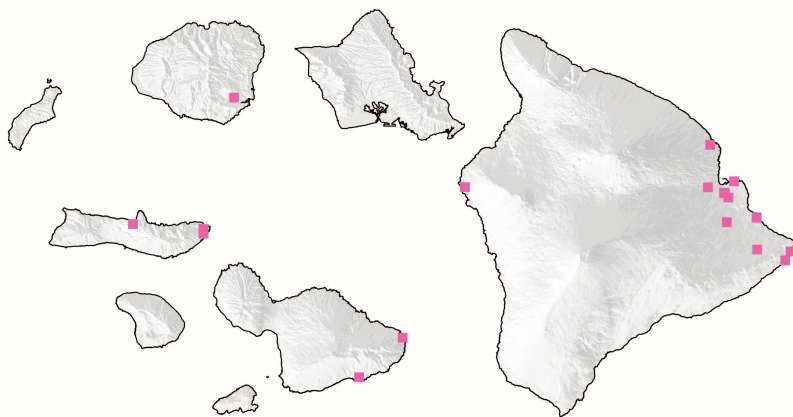


Figure 4. Distribution of *Cyperus sphacelatus* in Hawai'i, based on iNaturalist.org data and the specimens examined below.

Material examined. KAUA'I: Kauai Nursery & Landscaping off of Kaunua'i Hwy just W of Puhi, weed around garden center area, seen growing only in pots of plants for sale, rare, only one plant seen, 102 m, 21.963138, -159.405639, 08 Jul 2022, *K. Faccenda & S. Vanapruks 2523*. **MAUI:** Hāna, Waikoloa Rd leading to landfill, outside landfill entrance, wet, sunny roadside dominated by weeds, rare, only one plant seen along this road, 23 m, 20.769506, -155.991996, 23 Oct 2022, *K. Faccenda 2776*; Kaupō, Pi'ilani Hwy, ca. 2 km W of Kaupō town, roadside weed along edge of pasture, small patch of ca. 50 plants growing from gravel where water runs in a small ditch along the road, spikelets with reddish marking running along their middle, 93 m, 20.631221, -156.154641, 26 Oct 2022, *K. Faccenda 2797; loc. cit.*, 15 Mar 2023, *F. Starr & K. Starr 230315-01*. **HAWAII'I:** Hilo, shopping center at Mamalahoa Hwy and E. Kahaopea St, on edge of parking lot, infrequently mowed area, dominant weed in this area, 34 m, 19.692410, -155.066914, 07 Aug 2022, *K. Faccenda 2589*.

Eleocharis retroflexa (Poir.) Urb.**New state record**

While making a collection of *Fimbristylis schoenoides* near Kea'au, on Hawai'i Island, two small plants of *Eleocharis retroflexa* were accidentally collected and only noticed after the specimen was made. As this was collected accidentally, the population size is unknown. The specimen was first identified as *Eleocharis retroflexa* by the author using the key in Flora of North America Editorial Committee (1993) and confirmed by Mark Strong (US).

Eleocharis retroflexa has a pantropical distribution (POWO 2023); in China, it is found in generally moist areas, often in fields (Dai *et al.* 2010). Flora of North America Editorial Committee (1993) states that it is found along streambanks, ponds, marshes, and other wet sites. It can be distinguished from other *Eleocharis* in Hawai'i by its trigonous achenes with a cancellate surface and decurrent style bases (Figure 5), along with sessile spikelets often occurring at the base of the plant.

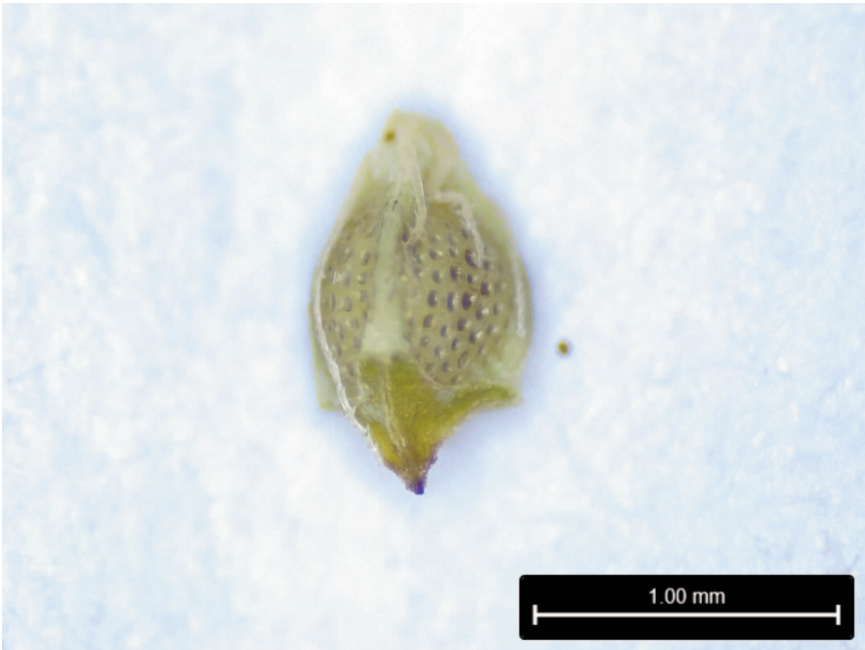


Figure 5. Photograph of the achene of the *Eleocharis retroflexa* plant collected near Kea'au.

The following description is from Flora of North America Editorial Committee (1993:98):

“Plants annual, tufted, mat-forming, often stoloniferous, sometimes entirely vegetative; rhizomes absent. Culms erect, ascending or arching, pentagonal, sulcate, 1.5–10 cm × 0.2–0.3 mm [larger], soft. Leaves: distal leaf sheaths persistent or disintegrating, pale brown to green, red-spotted [mostly red-brown], membranous; apex acuminate. Spikelets: basal spikelets usually present, bisexual; often proliferous, ellipsoid or obovoid, laterally compressed, 1.7–3.9 × 1.2–2 mm, apex acute; proximal

scale empty or with a flower, deciduous, amplexicaulous, similar to floral scales (sometimes 2.4–2.9 mm); subproximal scale with a flower; floral scales clearly distichous, 2–6 [or more], 4–6 per mm of rachilla, pale brown [marked red-brown], ovate or elliptic, 1.8–2.5 × 0.8–1.4 mm, membranous, apex rounded to obtuse, midribs green, keeled. Flowers: perianth bristles 6, colorless or pale brown, shorter than achenes; spinules not evident at 45×; stamens 3; anthers (0.55–)0.7 mm; styles 3-fid. Achenes stramineous (to cream), obovoid, trigonous or subterete, not compressed, angles prominent, 0.8 × 0.5–0.55 mm, apex not constricted proximal to tubercle, coarsely cancellate or honeycomb-reticulate at 10–15×. Tubercles red-brown, pyramidal, trigonous, proximally clearly to obscurely 3-lobed, lobes decurrent on achene angles, 0.3–0.35 × 0.3–0.4 mm.”

Material examined. **HAWAII:** Hwy 11 about halfway between Kea‘au and Kurtistown, near Kamehameha School, mowed roadside, sunny, moist, accidental collection with *Fimbristylis schoenoides*, 177 m, 19.606066, -155.050018, 14 Aug 2022, K. Faccenda & M. Murphy 2649.

***Fimbristylis aestivalis* (Retz.) Vahl**

New island record

Fimbristylis aestivalis is now known to occur on O‘ahu, where a single individual was found in the Nu‘uanu Stream bed. *Fimbristylis aestivalis* was previously reported as naturalized on Kaua‘i and Hawai‘i (Imada 2019).

Material examined. **O‘AHU:** Honolulu, Lili‘uokalani Botanical Garden, Nu‘uanu Stream bed, partly sunny, moist, gravel substrate, only one individual seen, 21.319622, -157.855725, 12 Jun 2021, K. Faccenda 1983.

***Fimbristylis squarrosa* Vahl**

New state record

A single plant of *Fimbristylis squarrosa* was found during a roadside survey at the end of ‘Āma‘uma‘u Rd. in Volcano on Hawai‘i Island growing in a wet, sunny area on a disturbed roadside habitat. *Fimbristylis squarrosa* is native to the Old World tropics and Australia but has become widely naturalized in the Americas (POWO 2023). It is generally a weed of seasonally wet areas (Gordon-Gray & Browning 2020). *Fimbristylis squarrosa* is unique among *Fimbristylis* as it has long, pendant hairs that descend from the style base and partially cover the top of the fruit (Gordon-Gray & Browning 2020). The plant is generally similar to *F. aestivalis* but differs in having fertile scales with recurved (squarrose) awns, while *F. aestivalis* has unawned to mucronate fertile scales, in addition to lacking hairs at the base of its style.

The following description is from Flora of North America Editorial Committee (1993:127):

“Plants annual, caespitose, delicate, to 30(–40) cm, bases soft; rhizomes absent. Leaves polystichous, spreading to ascending, to 1/2 length of culms or longer; sheaths entire or ciliate distally, backs hirtellous; ligule absent; blades linear-filiform, 0.5 mm wide, flat or involute, scabrid ciliate, often abaxially hirtellous. Inflorescences: anthelae simple or compound, mostly open, ascending-branched, mostly longer than broad; scapes filiform, 0.5 mm wide, distally compressed, mostly glabrous; longer involucre bracts leafy, equaling or exceeded by anthela. Spikelets greenish brown or brownish, lanceoloid or narrowly ellipsoid-cylindric, 4–5 mm; fertile scales ovate, acute, glabrous, midrib excurrent as slender, excurved cusp. Flowers: stamens 1; styles 2-fid, slender, base flat, long-fimbriate, hairs recurved over achene summit. Achenes pale brown, lenticular, obovoid, 0.9 mm, smooth or very finely reticulate.”

Material examined. **HAWAII:** Volcano, end of ‘Āma‘uma‘u Rd., sunny, wet roadside, rare, only one plant seen, base of style with hairs recurved and covering achene, style widest at base and triangular tapering, leaves and sheaths hairy, 1284 m, 19.482087, -155.267645, 13 Aug 2022, *K. Faccenda 2630*.

***Scleria gaertneri* Raddi**

New state record

Scleria gaertneri was found during roadside surveys on Maui, where one patch of about 30–40 plants at the beginning of the road to Hāna was seen. Examination of *Scleria* material at BISH revealed that the exact population observed by the author was collected 14 years prior by Forest Starr et al.. Furthermore, the specimen previously published as *S. testacea* from Moloka‘i by Oppenheimer (2008) was found by Mark Strong (US) to be misidentified and truly to be *S. gaertneri*. *Scleria gaertneri* is native to Africa and Central and South America and has previously been reported as naturalized in Florida (Franck et al. 2016). *Scleria gaertneri* has a plethora of synonyms, and older literature often refers to it as *S. melaleuca*, *S. pterota*, or *S. latifolia* (Galán Díaz et al. 2019). *Scleria gaertneri* can be distinguished from *S. testacea* by its 3-lobed hypogynium, fruits as long as wide, and mature fruits ranging from gray to white, whereas *S. testacea* has a cup-shaped hypogynium, and fruits longer than wide and consistently white fruits.



Figure 6. Flowers and fruits on *Scleria gaertneri* from the Maui population.

The following description is taken from Galán Díaz et al. (2019:210):

“Perennial, tufted with well-developed rhizome. Culm 35–80 cm by 1.3–1.6 mm. Leaves 10–30 cm by 5–8 mm, generally glabrous but central vein ciliate, some basal leaves with few but conspicuous hairs, margins scabrid; spine-like hairs present along the distal part of the leaves, antrorse, sheaths slightly winged; contraligule

triangular, glabrous, sometimes puberulous, strongly ciliate along the margin. Inflorescence with panicles spiciform, little branched, rachilla reddish, flattened, completely glabrous; one or two terminal panicles, up to 5 cm long; laterals solitary, generally two or three, distal panicle close to the terminal, basal much shorter than the internode; peduncles up to 5 cm. Spikelets unisexual, mostly 3/4 female; glumes bearing male flowers 2.5–3.5 mm long, female 3–3.5 mm, both straw-coloured with reddish margin and green midrib. Nutlets globose, 2–3 mm diam, smooth, hairy underneath, shiny, white; hypogynium deeply trilobed, margin revolute.”

Material examined. **MOLOKA‘I:** S of Pōhakupili Gulch, naturalized in pasture but localized, 385 m, 25 Nov 2007, *Oppenheimer H110738*. **MAUI:** Road to Hāna where it crosses over Waipi‘o Stream, wet, shady roadside, clump-forming sedge to 50 cm tall, perennial, fruits green or black when immature, drying bone white, glossy and smooth, hypogynium 3-lobed, achene 2.5 mm long with minute hairs present only at achene base, sheaths weakly winged, ca. 5 plants seen, 171 m, 20.904421, -156.233364, 23 Oct 2022, *K. Faccenda 2743; loc.cit.*, side of road under railguard, occasional in spray patches along highway, 600 ft [182 m], 231414N, 7880834E, 13 Feb 2009, *F. Starr et al. 090213-01*.

Scleria testacea Nees

Correction

Scleria testacea was published as occurring on Moloka‘i by Oppenheimer (2008), but this specimen has since been reidentified as *S. gaertneri* by Mark Strong (US). Therefore, *Scleria testacea* is now only known to occur on Hawai‘i Island, and potentially West Maui, where it was reported by Hillebrand in 1888, but has not been collected since (Wagner *et al.* 1990).

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