A NOTE ON *AMARANTHUS VIRIDIS* IN THE CALIFORNIA FLORA.— In their annotated checklist of the native and naturalized plants of San Francisco County, Howell et al. (1958) reported several new distribution records for California. One of these, *Amaranthus gracilis* Desf. ex Poir., was noted as a sidewalk weed in the Richmond District of San Francisco. A collection with several duplicates (*Howell 32939* at CAS and DS) was made in 1957 to document the occurrence of this amaranth. Howell identified and annotated the specimens as *A. viridis* L. and sent them to be verified by J. Sauer, an authority on amaranths who was then working on several species of weedy plants in northern California (Tucker and Sauer 1958). Sauer confirmed the identification but noted that the name "*A. viridis* is a *nomen confusum* and must be rejected" (Howell et al. 1958). The next available name for the species was *A. gracilis*, with which name Sauer annotated Howell's collec-

tion at CAS in 1958. In the supplement to his *A California Flora*, Munz (1968) indicated that *A. gracilis* had been reported from San Francisco and that it resembles *A. deflexus* L. except for its "wrinkled seeds." Howell et al. (1958) had noted that these species could be distinguished by the wrinkled (vs. smooth) utricles of *A. gracilis*. In *The Jepson Manual*, Henrickson (1993) noted under *A. deflexus* that plants "with wrinkled seeds have been called *A. gracilis* Desf." All species of *Amaranthus* in California have generally smooth seeds (at least at magnifications to 50×) but there is variation in the ornamentation of the fruit (utricle) that closely envelops the seed, and it is undoubtedly this feature that both Munz (1968) and Henrickson (1993) intended. Recent treatments of *Amaranthus* (e.g., Allen and Akeroyd 1993; Mosyakin and Robertson 2003) use Linnaeus' name, *A. viridis*, for this species and include *A. gracilis* as a synonym.

In treating *Amaranthus* for a new taxonomic account of the plants in San Francisco County (including 8 species of *Amaranthus*; Daniel in preparation), I had the opportunity to compare various published treatments of the genus with specimens collected in the county. Henrickson's (1993) key works very well for most plants from San Francisco. However, his implications that the plants reported from California as *A. gracilis* (i.e., Howell's collection) are similar to those of *A. deflexus* (except for the "wrinkled seeds") and that these might represent the same taxon are inaccurate. These two species appear abundantly distinct (in fact, more so than several other species of amaranth in the California flora, e.g., *A. hybridus* L. and *A. powellii* S. Wats; *cf.* Costea et al. 2001a).

Although *A. viridis* was not treated as occurring in California in either *The Jepson Manual* or the *Flora of North America*, both it and *A. deflexus* have been collected in the state. These two species can be distinguished from one another by the characters in the following couplet:

Mature utricles ovoid to ellipsoid, 2.5–3.2 mm long, smooth to somewhat wrinkled, inflated and much exceeding the size of the seed within; female flowers with 2 perianth segments (in San Francisco, elsewhere 2–3). *A. deflexus*

Mature utricles subglobose, 1.3–1.7 mm long, prominently warty-roughened, not inflated and barely exceeding the size of the seed within; female flowers with 3–4 perianth segments. *A. viridis*

They differ from most other species of *Amaranthus* in California by their indehiscent utricles. In other species the utricles either dehisce circumsessily (most species) or irregularly (*A. spinosus* L.); however, on occasion, species having utricles that usually dehisce may also possess fruits that remain indehiscent. Another species with indehiscent utricles, *A. blitum* L., has been noted to occur in California (Hrusa et al. 2002; Mosyakin and Robertson 2003). It was not treated by Hendrickson (1993) or Costea et al. (2001b) because it has only very recently been documented from the state. It appears to have been introduced with bedding plants raised outside of California and offered for sale at nurseries within the state (A. Sanders, pers. commun.). Its utricles resemble those of *A. deflexus* by their generally smooth surfaces; they differ from fruits of that species by their shape (subglobose to obovate) and lack of inflation (i.e., they do not appreciably exceed the size of the seed within).

Amaranthus viridis always has conspicuously warty-roughened utricles (Fig. 1c). Variations in shape, size, and surface texture were observed among utricles of *A. deflexus* (Fig. 1a–b) in San Francisco County. The surfaces of utricles from some plants have wrinkles (e.g., *Daniel 8792* from Bernal Heights) whereas others do not and are smooth (e.g., *Cannon s.n.* in 1895 from Post St.). This variation is likely responsible for some of the confusion between the two species in California.

Neither taxon is believed to be indigenous to California, but their native ranges are not known with certainty. *Amaranthus viridis* is usually noted as native to South America but introduced into tropical and subtropical regions worldwide. Mosyakin and Robertson (2003) indicated that it is known from much of the eastern and southern United States to Arizona. Within California, *A. viridis* is still known only from San Francisco where several plants occurred in or along sidewalks.

It has not been relocated in the county since Howell's collection, but it should be sought among amaranths that occur in disturbed habitats. *Amaranthus deflexus* is also believed to be native to South America and introduced into tropical or warm-temperate regions worldwide. Mosyakin and Robertson (2003) mapped its distribution in the eastern and southeastern United States, as well as on the Pacific Coast. It is widespread in California, occurring in disturbed habitats of western and central portions of the state.

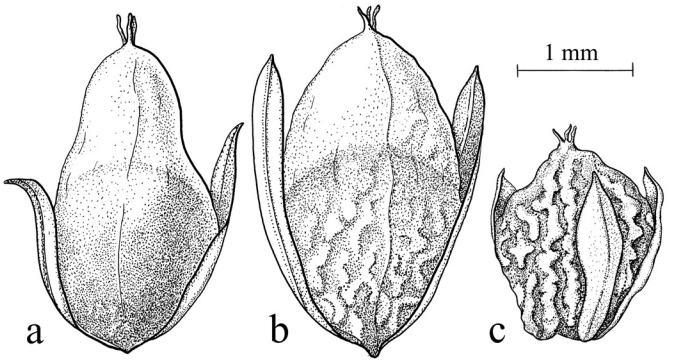

FIGURE 1. Perianth segments and utricles of *Amaranthus*. a. *A. deflexus* (*Cannon s.n.* in 1895), with smooth surface and ovoid shape. b. *A. deflexus* (*Daniel 8792*), with wrinkled surface and ellipsoid shape. c. *A. viridis* (*Howell 32939*), with warty-roughened surface and subglobose shape. Drawn by Meg Stalcup.

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