ATRIPLEX ERECTICAULIS (CHENOPODIACEAE): A NEW SPECIES FROM SOUTH-CENTRAL CALIFORNIA

HOWARD C. STUTZ
Department of Botany and Range Science, Brigham Young University, Provo, UT 84602

GE-LIN CHU
Institute of Botany, Northwest Normal University, Lanzhou, Gansu, China 730070

STEWART C. SANDERSON
USDA Forest Service Shrub Sciences Laboratory, Provo, UT 84601

ABSTRACT

Atriplex erecticaulis is a newly described annual species from dry lowlands in south-central California. It is a hexaploid species apparently most closely related to *A. cordulata* Jepson. All collections have been from Tulare, Kern, and Kings countries in uncultivated areas. Although limited in geographic and ecological distribution it is often abundant in non-cultivated natural areas.

Atriplex erecticaulis, sp. nov., a distinctive annual species of *Atriplex* with abundantly branched, erect stems was first collected by the senior author ca. one kilometer west of Earlimart in Tulare Co. California on 26 August 1989. It was collected previously in this same area in 1921 by H. M. Hall and in 1937 by R. E. Hoover. Earlier collections were also made by Elizabeth McClintock in 1963, by Jack Zaninovich in 1963 and in 1971, and by John Thomas Howell and Gordon H. True in 1967, in a vernal-pool natural-area about 8 km east-northeast of Pixley, Tulare Co. California. Each of these earlier collections was labelled *Atriplex cordulata* Jepson, a species that resembles *A. erecticaulis* in several attributes.

Atriplex erecticaulis Stutz, Chu & Sanderson sp. nov. (Fig. 1)—TYPE: USA, California, Tulare Co., ca. 500 m west of Earlimart, T23S R25E S33, elevation ca. 100 m, 16 Oct 1994, *H. C. Stutz 9691* (holotype, BRY).

Herbae annuae. Caulis erectus, maxime ramosus, 30–50 cm altus; rami teretes nec costati nec striati, furfuracei juventute. Folia Kranztyporum anatomiis, sessilia, alterna, cordata, deltoideo-ovata usque ovato-lanceolata, 5–15 mm longa, 5–12 mm lata, oblique patula, apice breviter acuminata, basi rotunda usque cordata, aliquando leviter amplexicaulia, integra, raro margine infra medium 1–2 irregulariter serrata, furfuracea utrinque; costa et pas lateraliis nervus

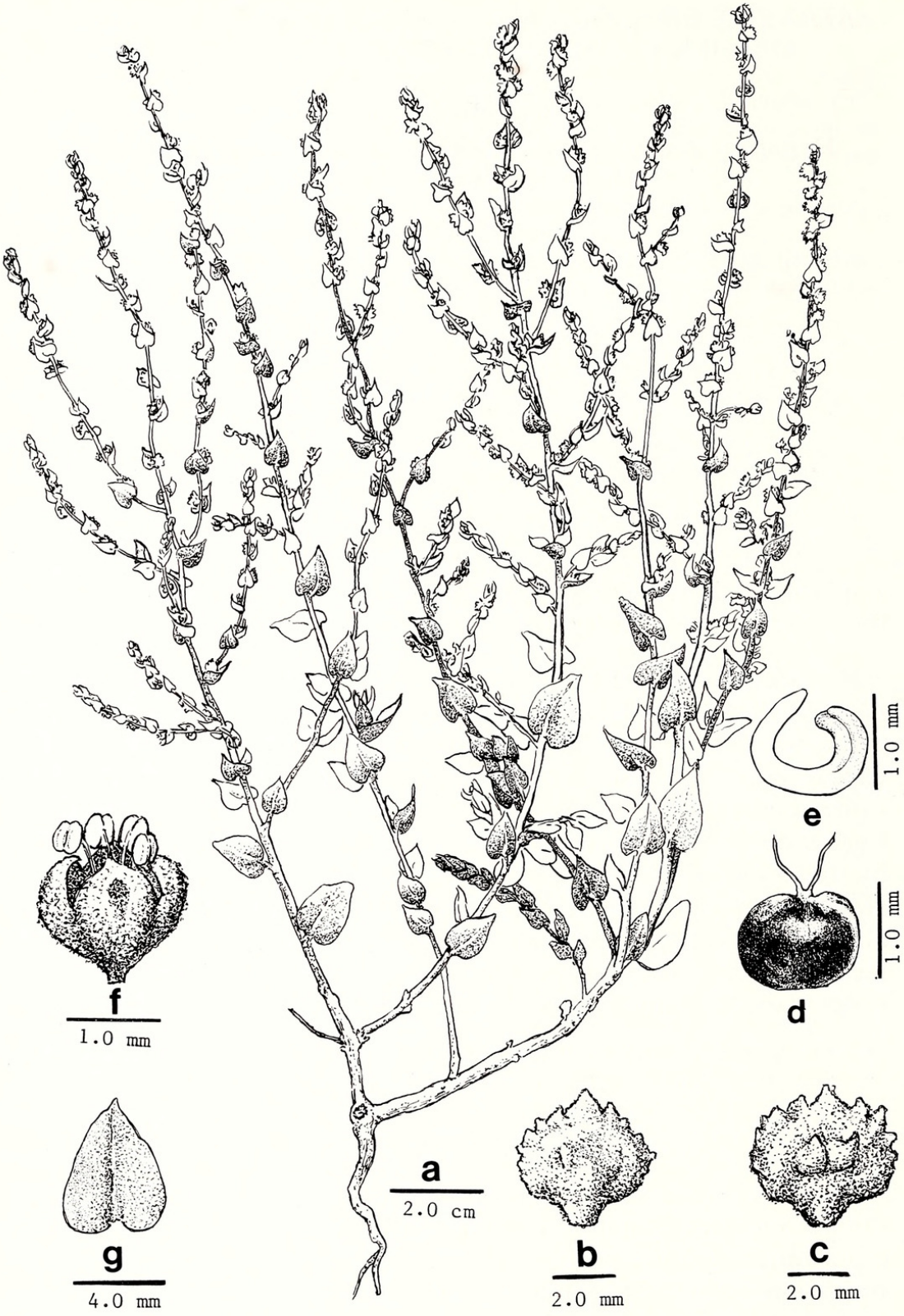

FIG. 1. *Atriplex erecticaulis*. a. Habit. b. Fruiting bract without appendages c. Fruiting bract with appendages. d. Utricle. e. Embryo. f. Male flower. g. Leaf. (Illustrations by Marcus A. Vincent.)

prominulus infra. Staminates et pistillati flores mixiti in glomerulum, axillares in ramorum partibus superioribus; perianthium staminalis floris subglobosum, ca 1.5 mm diam. 4-partium, raro 5-partium; segmenta ovato-oblonga, ca. 1 mm longa, membranacea, furfuracea, dorsaliter apice leviter carnosa et viridia; stamina tot quot segmenta, antheris obovato-oblongis, 0.8–1 mm longis, filamentis filiformibus, ca 1.5 mm longis, pistillo rudimentali punctiformi; bracteola pistillatis floris unita margine infra medium; stigmaeta 2; stylus obscurus. Fructiferae bracteae deltoideo-rhombeae usque flabellatae, 3–3.5 mm longae, 3–4 mm latae, dense furfuraceae, margine supra medium denticulatae, medio dente quam 2 contigui laterales dentes leviter maiori, basi et ad centrum leviter induratae, utrinque exappendices vel 1–2 irregularibus tuberculis. Utriculus transvergo-oblongus or suborbiculalus, ca 1.5 mm latus, pericarpio membranaceo. Semen atrobruneum, perispermio duro; radicula supera. Chromosomatum numerus $2n=54$.

Annual herbs. Stems erect, highly branched, 30–50 cm tall, terete, not ribbed nor striate, furfuraceous when young. Leaves sessile, commonly appressed to branches, alternate, deltoid-ovate to ovate-lanceolate, 5–15 mm long, 5–12 mm wide, apex short acuminate, base rotund to cordate, sometimes slightly clasping, entire, margin sometimes with 1–2 pair of irregular teeth below the middle, midrib and one pair of lateral veins prominent on abaxial surface, furfuraceous on both surfaces, Kranz-type venation. Plants monoecious; male and female flowers in mixed glomerules, axillary on upper branches; perianth of staminate flowers subglobose, ca. 1.5 mm in diameter, 4- rarely 5-parted, segments ovate-oblong, ca. 1 mm long, covered with elongate hairs, spreading when flowering, slightly fleshy and green dorsally near apex, margin membranaceous; stamens as many as perianth segments, anthers obovate-oblong, 0.8–1 mm long, yellow, filaments filiform, ca. 1.5 mm long, slightly broadening and united toward base, pistil rudimentary, punctate; fruiting-bracts deltoid-rhombic to flabellate, compressed, united below the middle, 3–3.5 mm long, 3–4 mm wide, densely furfuraceous, slightly indurate centrally near base, mostly unappendaged, rarely with a few irregular tubercles on both surfaces, upper margin denticulate, middle tooth same size as lateral teeth or slightly larger. Utricle transverse-oblong or suborbicular, ca. 1.5 mm across, pericarp membranaceous, stigmas 2, ca. 1.2 mm long, style obscure. Seed dark-brown, perisperm farinose, radicle superior. Flowering and fruiting period: August–October. Chromosome number: $2n=54$.

PARATYPES: USA, California, Kern Co., SE corner of junction of Rowlee Rd and Pond Rd, very bushy, 5 Aug 1995, *H. C. Stutz 9785* (BRY). Kings Co., ca. 12 mi W of Tulare, 30 Aug 1994, *H. C. Stutz 9655* (BRY). Tulare Co., 3 mi S of Pixley, Airport St., 5 Oct 1995,

H. C. Stutz 9844 (BRY); Pixley National Wildlife Refuge, abundant roadside and inside Refuge, 5 Aug 1995, *H. C. Stutz 9788* (BRY); 1 mi W of Earlimart, 29 Jun 1995, *H. C. Stutz 9770* (BRY); Harmon field, westside of Pixley, T23S R25E S6, 16 Oct 1994, *H. C. Stutz 9692* (BRY); ½ mi W of Pixley, 30 Aug 1994, *H. C. Stutz 9656* (BRY); 1 mi W of Pixley, 30 Aug 1994, *H. C. Stutz 9652* (BRY); 1 mi W of Earlimart, 28 Aug 1994, *H. C. Stutz 9645* (BRY); ¼ mi W of Earlimart, 9 Oct 1993, *H. C. Stutz 95967* (BRY); 10 mi W of Earlimart, 18 Aug 1990, *H. C. Stutz 95354* (BRY); 1 km W of Earlimart, very, very abundant, 26 Aug 1989, *H. C. Stutz 95141* (BRY); Pixley Nature Conservancy Preserve, common in dry area, 8 Aug 1971, *Jack Zaninovich 73-338, 73-335* (CAS); vernal-pool natural-area in Valley Grassland, about 4½ mi east–northeast of Pixley, elev. 275 ft, 15 May 1968, *John Thomas Howell* and *Gordon True 44465* (CAS); vernal-pool natural-area in Valley Grassland, about 4½ mi east–northeast of Pixley, elev. 275 ft, 3 Nov 1967, *John Thomas Howell 44062, 44071, 44031, 44078, 44079, 44080* (CAS); vernal-pool natural-area in Valley Grassland, about 4½ mi east–northeast of Pixley, elev. 275 ft, 21 Sep 1967, *John Thomas Howell* and *Gordon H. True 44009, 44010, 44011, 44012, 44013* (CAS); vernal-pool natural-area in Valley Grassland, about 4½ mi east-northeast of Pixley, elev. 275 ft, 21 Sep 1967, *John Thomas Howell* and *Gordon True 44008* (CAS); vernal-pool natural-area in Valley Grassland, about 4½ mi east-northeast of Pixley, 10 Aug 1967, *John Thomas Howell* and *Gordon True 43724, 43725* (CAS); vernal-pool natural-area in Valley Grassland, about 4½ mi east-northeast of Pixley, 6 Jul 1967, *John Thomas Howell* and *Gordon True 43234, 43211* (CAS); Pixley Natural Area, about 5 mi east–northeast of Pixley, 40 acres of vernal pools owned by the Nature Conservancy, 22 Jun 1967, *Elizabeth McClintock* (CAS); vernal-pool natural-area in Valley Grassland, about 4½ mi east–northeast of Pixley, elev. 275 ft, 31 May 1967, *John Thomas Howell* and *Gordon True 42514* (CAS); Jack Zaninovich property: 40 acre vernal pool area near Pixley, ½ mi N of Ave 104 on road 124, much branched, Sep 1963, *Jack Zaninovich* (CAS); Jack Zaninovich property: 40 acre vernal pool area ½ mi N of Ave 104 on Rd 124, 3 Aug 1963, *Elizabeth McClintock* (CAS); Earlimart, 10 Aug 1937, *R. E. Hoover 2676* (UC); Earlimart, 10 Oct 1921, *H. M. Hall 11786* (UC, CAS).

Distribution and habitat. Atriplex erecticaulis appears to be restricted in distribution to an area of about 3000 km^2 in Tulare, Kern, and Kings Counties, California, at elevations below 100 meters. It is particularly abundant in the Pixley National Wildlife Refuge southwest of Pixley and in the Pixley Nature Conservancy, ca. 8 km east-northeast of Pixley. It is also abundant south of Pixley and west

TABLE 1. CONTRASTING CHARACTERISTICS OF *ATRIPLEX ERECTICAULIS* AND *A. CORDULATA*.

Characteristic	*A. erecticaulis*	*A. cordulata*
Habit	bushy	strict
Branching	profuse	sparse
Flowering period	Aug and Sep	Jun and Jul
Anther color	yellow	purple or red
Fruiting-bract shape	deltoid-rhombic to flabellate	broadly deltoid-ovate
Fruiting bract dentation	central and lateral teeth, ca. same size	central tooth largest
Chromosome number	2n=54	2n=36

of Earlimart in fields that appear to have never been cultivated. In vernal-pool areas in Tulare County, it is common on dry sites between vernal-pool depressions but not within the depressions. Roadside populations are present along the Gun Club Road ca. 15 km west of Wasco, Kern Co., California, along Airport Street ca. 5 km south of Pixley, and along Sierra Ave. ca. 5 km west of Earlimart, Tulare county.

Although *A. erecticaulis* is now apparently restricted to a relatively small geographic area, it may have had a much wider distribution prior to recent agricultural practices that have destroyed its habitat. However, its current abundance in preserves and in areas that are not subject to cultivation, suggests that its immediate survival is not being threatened.

Taxonomic Relationships. Atriplex erecticaulis appears to be most closely related to *A. cordulata* Jepson. They both have sessile, cordate leaves, upright, robust growth habit, and 4-(rarely 5-)parted male flowers. As shown in Table 1, they differ in several significant attributes including chromosome number, flowering periods, anther color, fruiting-bract shape (Fig. 2), fruiting-bract dentation (Fig. 2), and growth habit. The "robust and much branched bushy plants" mentioned by Hall and Clements (1923, p. 271) as a distinct form of *A. cordulata* probably refer to *A. erecticaulis* plants. This is particularly likely since Hall's collection #11786 (UC) Earlimart, Tulare County, CA, labelled *A. cordulata*, is clearly a specimen of *A. erecticaulis*.

A. erecticaulis is the only reported native annual hexaploid species of *Atriplex* in California. Other *Atriplex* species that grow in the vicinity of *A. erecticaulis* are either tetraploid (*A. cordulata*, *A. coronata* Wats., *A. trinervata* Jepson), or diploid (*A. elegans* (Moq.) Diet., *A. miniscula* Standley, *A. serenana* Nels.). (All counts were determined from pollen-mother cells taken from anthers fixed in 5%

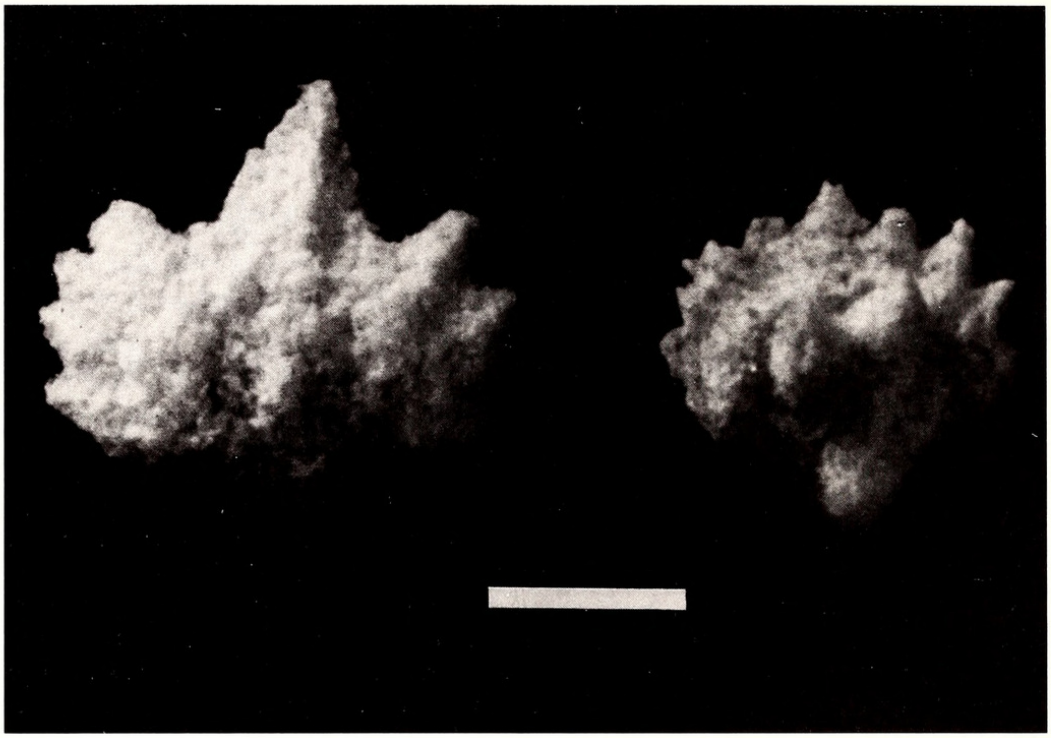

FIG. 2. Fruiting bracts of *Atriplex cordulata* (left) and *A. erecticaulis* (right).

acetic acid, stored in 70% ethyl alcohol and squashed in acetocarmine stain.)

Flowering of *A. erecticaulis* is mostly in August and September, considerably later than all associated *Atriplex* species. Plants of *A. erecticaulis* grown in greenhouses and nurseries at Brigham Young University, Provo, Utah from seeds collected from plants growing in natural populations, had the same characteristics as plants growing in nature, including a late flowering period, suggesting high heritability of their distinctive attributes.

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LITERATURE CITED

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