

**INFRASPECIFIC ADJUSTMENTS IN *JUNIPERUS DEPPEANA*  
(*CUPRESSACEAE*)**

**Robert P. Adams**

Biology Department, Baylor University, Box 97388, Waco, TX 76798,  
USA

**email Robert\_Adams@baylor.edu**

**Andrea E. Schwarzbach**

Department of Biological Sciences, University of Texas at Brownsville  
Brownsville, TX, 78520, USA.

**ABSTRACT**

Recent DNA sequencing data have shown that *J. gamboana* is well supported in a clade that includes other varieties of *J. deppeana*. *Juniperus gamboana* has checkered bark as is common in *J. deppeana*, and is treated herein as a variety of the latter, *J. deppeana* var. *gamboana* (Mart.) R. P. Adams, **comb. nov.** Examination of *J. deppeana* var. *zacatecensis* shows that it only differs from *J. d.* var. *deppeana* in having larger, more glaucous female cones, so it is reduced to the forma: *J. deppeana* f. *zacatecensis* (Mart.) R. P. Adams, **stat. & comb. nov.** A key and revised distribution map of *J. deppeana* is presented.

**KEY WORDS:** *Juniperus deppeana* varieties, *J. gamboana*, *J. deppeana* var. *gamboana*, *J. deppeana* f. *zacatecensis*, *Cupressaceae*, taxonomy.

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*Juniperus deppeana* Steudel and *J. gamboana* Martinez are species whose stem bark commonly exfoliate in quadrangular plates (Zanoni and Adams, 1976, 1979). These two species are part of the serrate leaf margined *Juniperus* species of the western hemisphere (Adams, 2004). The first systematic treatment of these junipers was by Martinez (1963).

DNA sequencing of nrDNA (ITS) and trnC-trnD (Schwarzbach, et al. 2007) has revealed that *J. deppeana* and its varieties form a clade that includes *J. gamboana* (Fig. 1). In addition, *J. deppeana* var. *deppeana*, *J. d.* var. *patoniana* and *J. d.* var. *robusta* are each distinct clades (Fig. 1). The bark exfoliation patterns in *Juniperus deppeana* and *J. gamboana* are shown in figure 2. *Juniperus gamboana* differs from *J. deppeana* by

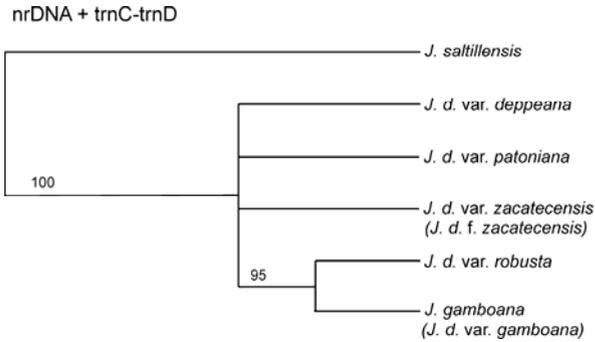


Figure 1. Phylogenetic tree derived from nrDNA + trnC-D sequence data (adapted from Schwarzbach et al., 2007). Notice the support (95%) for the clade of *J. d. var. robusta* and *J. gamboana*. The other varieties of *J. deppeana* are resolved as distinct clades.



*J. d. var. deppeana*



*J. d. var. patoniana*



*J. d. var. robusta*



*J. d. var. gamboana*

Figure 2. Comparison of bark exfoliation patterns. Note the checked bark of *J. d. var. gamboana* and the phylogenetically closely related *J. d. var. robusta*. (The photos of *J. d. var. patoniana* and *J. d. var. robusta* are from T. A. Zanoni).

having one (sometimes 2) seed per cone versus (1) 2 - 7 seeds per cone. Considering their similar morphology and the new DNA sequence data, it seems appropriate to treat *J. gamboana* as a variety of *J. deppeana*:

***Juniperus deppeana* Steudel var. *gamboana* (Martinez) R. P. Adams, comb. nov.**

BASIONYM: *Juniperus gamboana* Martinez., Anales Inst. Biol. Univ. Nac. Mexico 15(1): 7 (1944).

Cedro, cipres, cipres comun, bac'il nuhkupat (Tzeltal at Tenejapa, Chiapas), K'uk',ton, nukul pat (Tzotzil at Zinacantan, Chiapas), gamboa juniper. Type: Mexico: Chiapas: near Teopisca, *Martinez 6701* (Holotype: MEXU!)

Distribution: on limestone soils in pine-oak and pine-oak-juniper forest in the mountains at 1670-2200 m in Chiapas, Mexico; on limestone hillsides near San Miguel Acatan at 1920-2140 m in the Sierra de los Cuchumantes of Depto. Huehuetenango, Guatemala (see Fig. 3).

Because *J. deppeana* var. *zacatecensis* differs from *J. d.* var. *deppeana* only in having larger, more glaucous female cones, such variation appears to fit more closely that of a form:

***Juniperus deppeana* Steudel f. *zacatecensis* (Martinez) R. P. Adams, stat. & comb. nov.**

BASIONYM: *Juniperus deppeana* var. *zacatecensis* Martinez, Anales Inst. Biol. Univ. Nac. Mexico 17(1): 57 (1946).

Zacatecas juniper, cedros. Type: Mexico: Zacatecas: 10 km. W. of Sombrette. *Martinez A503* (Holotype: MEXU!).

*Juniperus zacatecensis* (Martinez) Gausson. Trav. Lab. Forest. Toulouse Tome II. Sec. I Vol. 1. partie II 2. fasc. 10. 151. 1968

The forma differs from *J. d.* var. *deppeana* in having larger (10-20 mm diam.) female cones with a heavy bloom (waxy coating).

Distribution: In oak-pine-juniper and pinyon-juniper woodlands and on grasslands on hills at 1980- 2470 m elevation, Zacatecas and adjacent Durango and Aguascalientes, Mexico (see Fig. 3).

*Juniperus deppeana* and its varieties form a discontinuous ring in the mountains above 2000 m (occasionally down to 1500 m) around the Chihuahuan desert in the southwestern US and Mexico, thence at 1600 - 2200 m in the mountains in the very southern-most part of Mexico and northern Guatemala (Fig. 3). Wells (1966), using data from rat middens

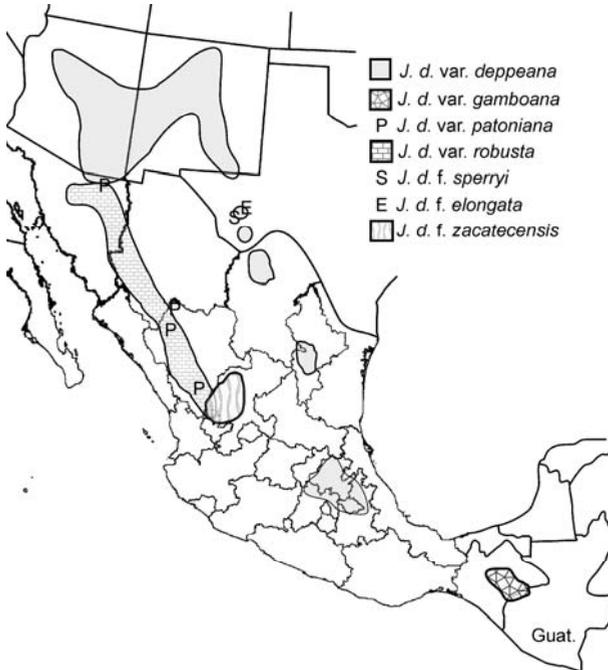


Figure 3. Distribution map of *J. deppeana*. The population of *J. d. var. patoniana* (P) in n. Sonora, Mexico has previously been called *J. d. f. sperryi*, but appears more likely to be *J. d. var. patoniana*.

from the Big Bend Texas region, concluded that during the Wisconsin (70,000 - 13,000 ybp) life zones descended about 800 m enabling the formation of pinyon-juniper in the present Chihuahuan desert between the Big Bend Region of Trans-Pecos, Texas and the city of Del Rio. Even if the effects of glaciation were mediated southward into Mexico so that life zones descended only a few hundred meters in Hidalgo, it appears that all of the now disjunct populations (varieties) of *J. deppeana* were connected

in a continuous ring of distribution around the Chihuahuan desert (perhaps with islands of *J. deppeana* within the ring). The recently described *J. d. f. elongata* R. P. Adams (Adams & Nguyen, 2005) grows as scattered trees in the Davis Mountains of Trans-Pecos, Texas.

Key to *Juniperus deppeana* varieties:

- 1a. Terminal whips long (15 - 30 cm) and pendulous, all (or nearly all) leaves on adult plants juvenile (decurent, or whip type)  
.....var. ***deppeana* f. *elongata***
- 1b. Terminal whips short (5 - 10 cm) and not pendulous, all leaves on adult plants scale-like (except on new growth where whip leaves occur)
  - 2a. Seed cones small (5-8 mm diam.), with soft pulp and 1(2) seeds, reddish brown with a light bloom, Chiapas, Mexico and adjacent Guatemala.....var. ***gamboana***
  - 2b. Seed cones large (8-20 mm diam.), woody and (1) 2 - 7 seeds, brown, reddish brown, or purplish with little to copious bloom, from central Mexico northward to Arizona and New Mexico in USA.
    - 3a. Stem bark longitudinally furrowed into long, interconnected strips, terminal whip branches often flaccid and pendulous.....  
..... var. ***deppeana* f. *sperryi***
    - 3b. Stem bark in quadrangular plates or in longitudinal strips (occasionally interconnected, if exfoliating in strips, then foliage not weeping), occasionally quadrangular plates at the trunk base, terminal whip branches ascending to erect
      - 4a. Stem bark exfoliating in longitudinal strips (occasionally interconnected) or with plates near the trunk base.....  
.....var. ***patoniana***
      - 4b. Stem bark exfoliating in square or oblong quadrangular plates, not in strips.
        - 5a. Trees with a strong central axis, no major side branches, crown pyramidal, and open as in *Cupressus*, often with 2 (3-4) trunks rising at (or below) ground level.....var. ***robusta***
        - 5b. Trees with round crown, branching at 1-4 m to produce irregular, round crown, usually with a single trunk
          - 6a. Mature female cones larger, 10-20 mm. diam., heavy bloom (glaucous waxy coating) on cone surface causes cone to appear white; shrub/small round topped tree (to 8m)

.....var. *deppeana* f. *zacatecensis*  
 6b. Mature female cones smaller, 8-15 mm diam., glaucous  
 or not, if glaucous not appearing as white, small to large  
 trees .....var. *deppeana*

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