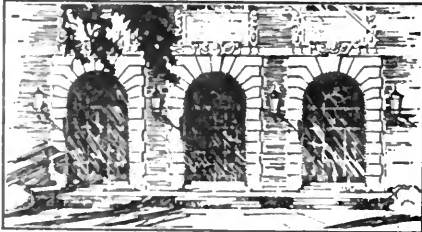


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A New Species of *Juniperus* from Mexico

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A new species of juniper was discovered southeast of Saltillo, Coahuila, Mexico, while I was studying variability in Mexican junipers and the ecology of the juniper-piñon association. This work was done on a grant from the National Science Foundation, NSF-GB-1860, under the administration of the Oklahoma University Research Institute, Norman, Oklahoma.

Juniperus saltillensis Hall, new species

Frutex 7 m., coma latior quam alta, multitruncus et ramosus humi vel supra paululum; frons clara rava-viridis; virgae ravae et vestitae effusius ramulis patulis recurvis fragiliter et concise vel languidis ad apices; cortex in infulis longis, densis, mollibus, squameis, exterior albulus-ravus, interior rufus; matura folia (cum) curti surculi squamis fere terna, solum decussata in ramulis extremis, appressa densè et rotunda ad apicem obtusum, non implicantia nisi in aliquibus ramulis extremis, 1-(1.5) 2 mm. longa, acuta ad obtusa, margines dentales subtiliter, densè, nullo ordine, dorsalis glans ovata plana ubi praesens, reperta centraliter in vagina-folii; folia (cum) longis surculis 3-(4) 6 mm. longa, terna, cum dorsalibus glandibus linearibus, elevatis, forma lacrimae, 1.5-(2) 4 mm. longis; frutex dioicus, interdum monoicus; coni microsporangati 2-(3) 3.5 mm. longi, microsporophylla 8-(12), deltoidea, obtusis, dentales subtiliter, fere carinata, carina altissima ad apicem, prope appressa et firme implicantia, dorsalis glans parva et obscura ad basem squamae, microsporangia 3-(4); bacae-coni ovoidei latiores quam longi, 5-(6) 7 mm. longi, 4.5-(6) 8 mm. lati, clari albili-caerulei, glauci, rubri sub pruinā, fibrosi et resinati cum copiosis saccis parvis resinae, maturantes anno, megasporophylla 2 pares decussati, pingues et claudentes bacam-conum in apice; semina (1) 2-3, ovoidea, sulcata, 4-5 mm. longa, circa 3 mm. lata, brunnea ubi matura hilum basali dimidium spatium ad apicem, flavum vel eburnum, hilum et basis seminis glandulosum-puteosum.

Widely branching shrub to 7 m., crown broader than high, multi-stemmed and branching at ground level or slightly above; foliage light grayish-green; twigs gray and densely clothed with widely spreading branchlets crisply and shortly recurved or drooping at the tips; bark in long thick, soft, flaky ribbons, outer

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FIG. 1. Herbarium specimens photographed to show branching types and bark characters of *Juniperus saltillensis*. A, B, are one extreme and resemble branching in *J. flaccida*. C, D, the other extreme of branching, resemble *J. durangensis*. Photographs $1/9 \times$ natural size.

whitish-gray, inner red-brown; adult short-shoot scale leaves mostly ternate, decussate only on ultimate branchlets, closely appressed, thick and rounded to a blunt tip, not overlapping except on some ultimate branchlets, $1-(1.5)^1$ 2 mm. long, acutish to obtuse, finely, densely, irregularly toothed margins, dorsal gland ovate and flat when present, located centrally on the leaf sheath; long-shoot leaves 3-(4) 6 mm. long, ternate, with linear, raised dorsal glands, teardrop-shaped, 1.5-(2) 4 mm. long; dioecious, occasionally monoecious; microsporangiate cones 2-(3) 3.5 mm. long, microsporophylls 8-(12), deltoid, obtuse, finely toothed, usually keeled, the keel highest toward the tip, closely appressed and strongly overlapping, dorsal gland small and inconspicuous at the base of the scale, microsporangia 3-(4); berry-cones ovoid to wider than long, 5-(6) 7 mm. long, 4.5-(6) 8 mm. wide, bright whitish-blue, bloomy, wine-red beneath the bloom, fibrous and highly resinous with abundant small resin sacs, ripening in one year, megasporophylls two decussate pairs, fleshy and closing the berry-cone at the tip;

¹ Values within parentheses throughout the description are average values for the characters studied from the Saltillo population.

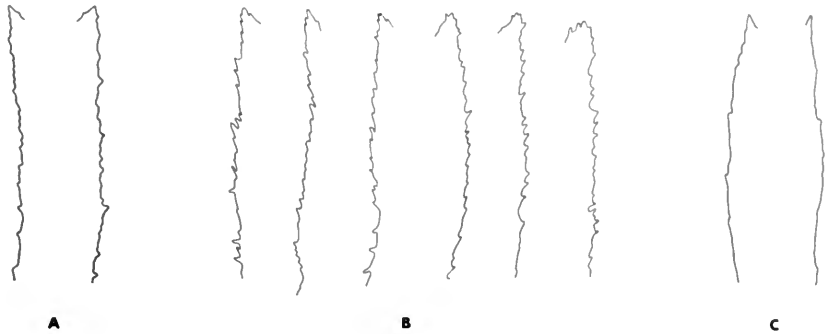


FIG. 2. Camera lucida tracings of margins from long-shoot leaves. A, Two tracings of leaf margins from *J. durangensis*; B, six tracings from *J. saltillensis*; C, two tracings from *J. flaccida*. Tracings are of approximately 6 mm. from tips toward bases of leaves. 10 ×.

seeds (1)–2–3, ovoid, grooved, 4–5 mm. long, about 3 mm. wide, dark brown when mature, basal hilum half the distance to the apex, yellowish or ivory, hilum and base of seed gland-pitted.

Mexico: Coahuila. Eighteen miles southeast of Saltillo on northeast-facing slopes of hills bordering Mexico Highway 57 at 6,700 ft. alt., *Hall 66305-1* (holotype, F; OKL; MO; others).

Habitat.—Twenty-degree slope, in thin, rocky, limestone soil weathered to gray containing abundant white limestone fragments, associated with *Juniperus deppeana* Steud., *Juniperus flaccida* Schlecht., and *Pinus cembroides* Zucc.

This new species is associated with *Juniperus flaccida* at the lower edge of the piñon-juniper woodland, where a number of mesquite-grassland species intermix. Mesquite, Ocotillo, and Creosote Bush disappear at about 6,000 ft. but Desert Willow, Lechuguilla, *Yucca carnerosana*, *Rhus microphylla*, *Cercocarpus montanus* var. *paucidentatus*, *Dasyllirion texanum*, Agarito, *Opuntia imbricata*, *Acacia constricta*, and One-Seed Juniper intermix with the lower portion of the piñon-juniper woodland at 6,200 ft. Heavy grazing pressure from goats probably has extended this zone of mixing. *Juniperus deppeana* forms the association with *Pinus cembroides* beginning at 6,200 ft. and becoming nearly a pure stand of piñon at 7,500 ft. A few specimens of *Pseudotsuga menziesii* occur with piñon at 7,500 ft. From 6,700 to 7,200 ft. both *Juniperus flaccida* and *Juniperus saltillensis* are frequent. At this location, the population of *J. saltillensis* consisted of 17 trees and the major associates listed above. I have observed and collected *Juniperus*

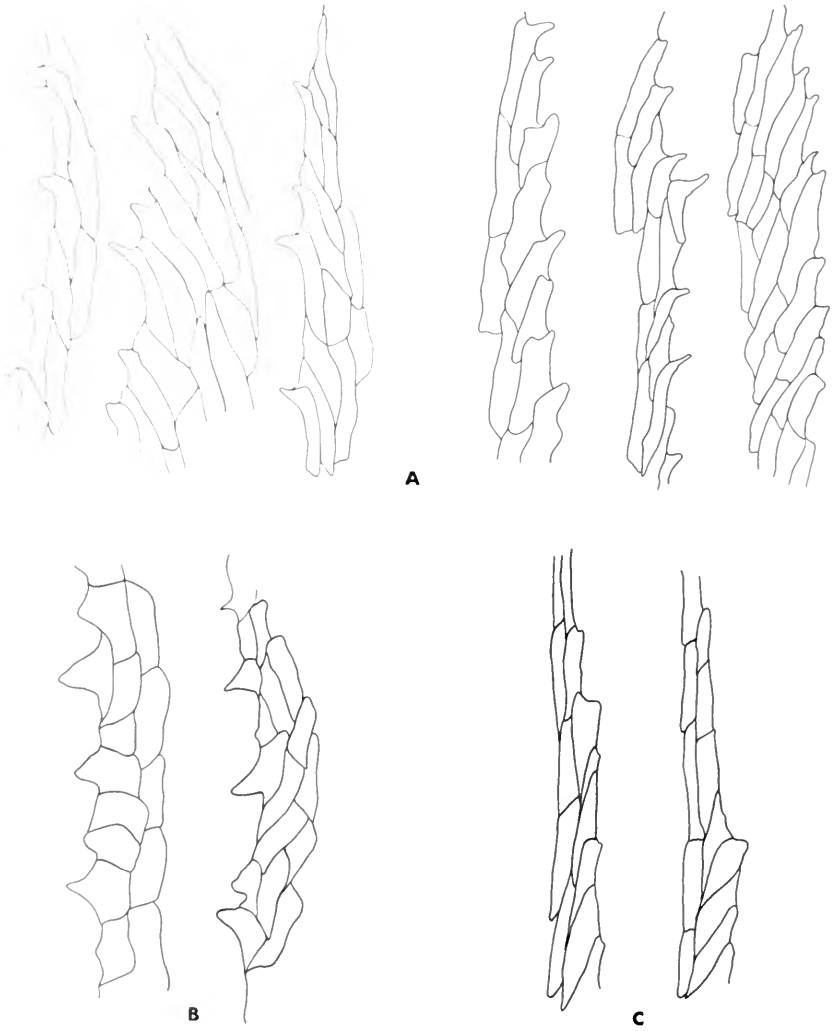


FIG. 3. Camera lucida tracings of marginal epidermal cells mid-distance from leaf base to tip, from long-shoot leaves. **A**, six tracings from *J. saltillensis*; **B**, two tracings from *J. durangensis*; **C**, two tracings from *J. flaccida*. The letters, A, B, C, are oriented at basal ends of leaf segments. 180 ×.

saltillensis as far south as San Roberto, Nuevo Leon, about 60 miles south of Saltillo, Coahuila, (Hall 66524-31) and as far north-west as Parras de la Fuente, Coahuila, on northeast slopes of the same elongate range of hills in which the Saltillo population occurs. Apparently, this species occurs in isolated stands between Parras de la Fuente and Galeana, Nuevo Leon, but perhaps more widely.

Juniperus saltillensis is rather intermediate in many characters between *Juniperus flaccida* and *Juniperus durangensis* Martinez. In habit the new species, *Juniperus saltillensis*, resembles *Juniperus flaccida* since the plants are multi-stemmed, usually broader than tall, with leaf-bearing branches fan-shaped and generally broader than long. In most technical details it approaches *Juniperus durangensis* more closely. It is closely intermediate in so many characters that one is tempted to consider *Juniperus saltillensis* of hybrid origin, but the berry-cones are in no way intermediate, relating closely to those of *Juniperus durangensis*. Clearly, *Juniperus saltillensis* is more variable within the individual plant—as well as between plants—than are either of the other two species. *Juniperus saltillensis* may be distinguished from *Juniperus duran-*

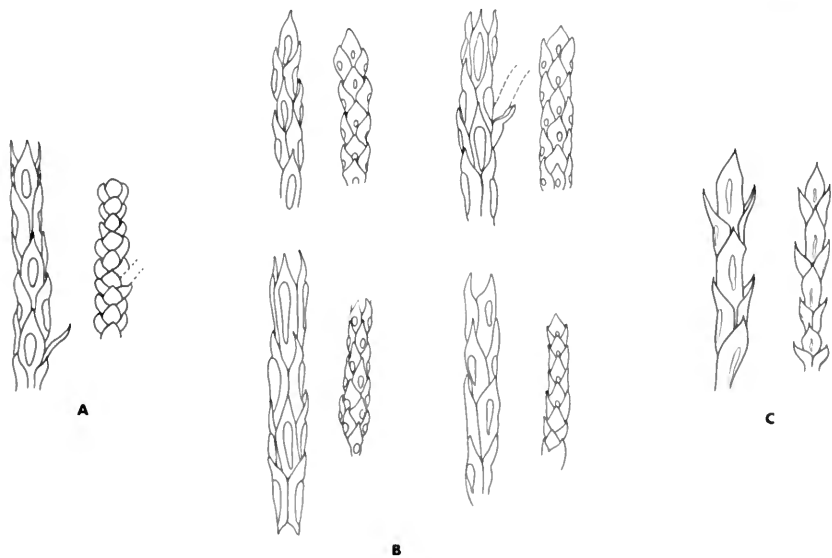


FIG. 4. Camera lucida tracings of leaf types; long-shoot leaves to the left in each pair, short-shoot leaves to the right. A, two from *J. durangensis*; B, eight from *J. saltillensis*; C, two from *J. flaccida*. 2.5 ×.

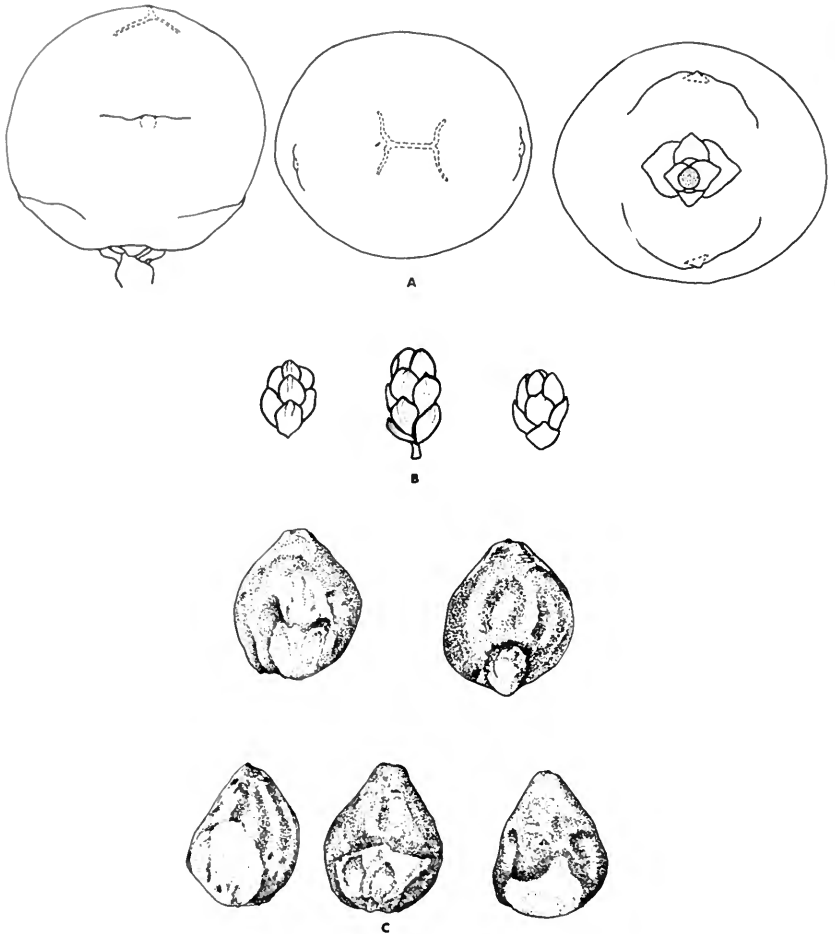


FIG. 5. *J. saltillensis*. A, berry-cones, two ranks of decussate scales. B, microsporangiate cones, note sharply keeled tips of microsporophylls. C, seeds, note light colored hilum, resin pits, and grooves. 5 ×.

gensis by its habit, its gray-green foliage, and its longer than wide, bright blue, very bloomy berry-cones.

This new species, *J. saltillensis*, belongs in association with those species of higher altitudes and more mesic habitats, *J. monticola* Mart., *J. standleyi* Mart., and the poorly known species, *J. jaliscana* Mart., and *J. blancoi* Mart. *J. saltillensis* is more xeric in habitat than its closer relatives and has on the average fewer seeds per berry-cone. It may be considered a taxon which links the poly-

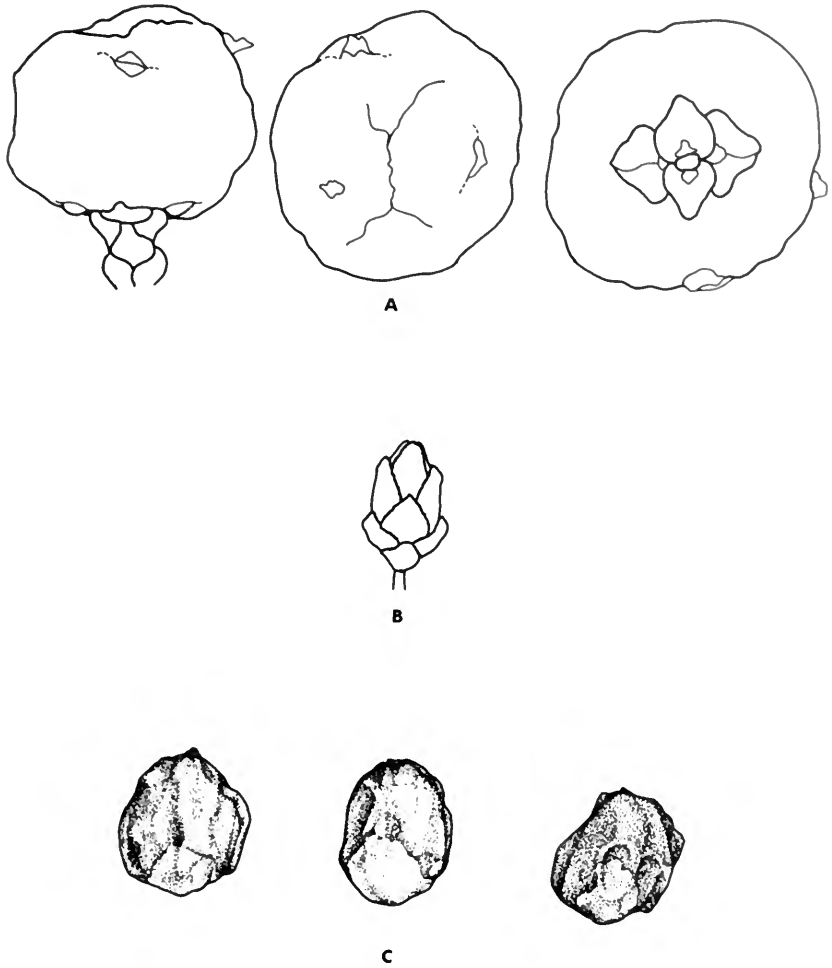


FIG. 6. *J. durangensis*. A, berry-cones, two ranks of decussate scales. B, microsporangiatic cones, note acute tips without keels on the microsporophylls. C, seeds, note irregular shapes because of thin flanges. 5 ×.

spermous, mesic species with the xeric monospermous ones. This species is most attractive and should be considered for cultivation in appropriate areas.

Figure 1 shows the extremes of characters from secondary branches of *Juniperus saltillensis*. A and B show the broad form of branching where often the vegetated portion is broader than long and the angle of branching is wide. These traits correlate with a

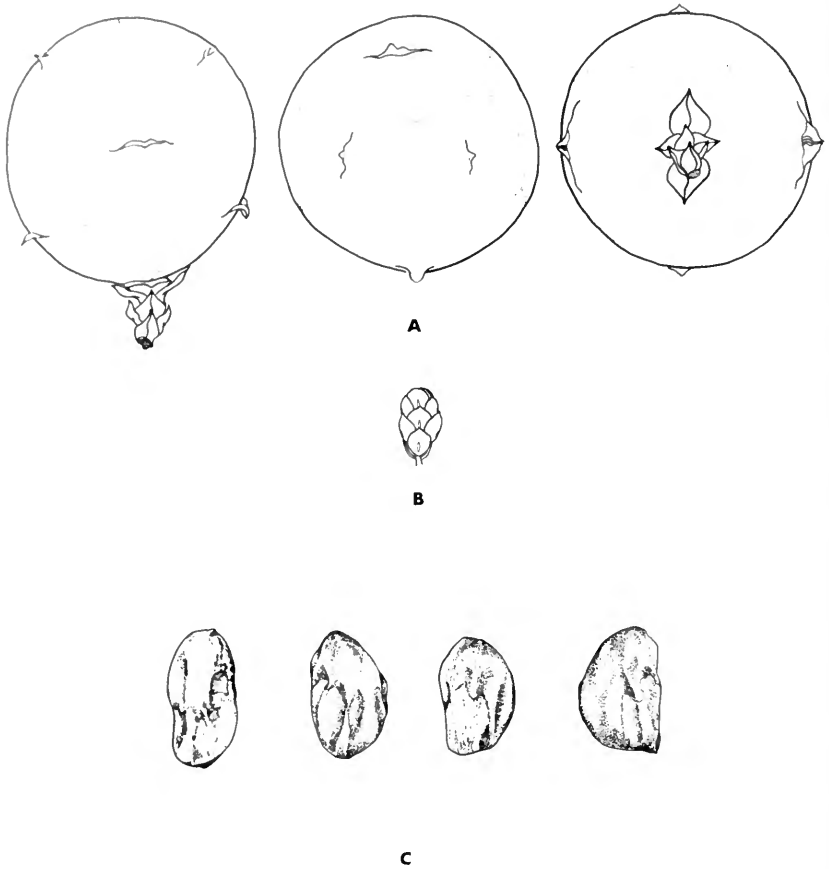


FIG. 7. *J. flaccida*. A, berry-cones, three ranks of decussate scales showing outlines of megasporophylls. B, microsporangiate cones with slender glands on microsporophylls. C, seeds, irregular, deeply pitted and grooved, no flanges. 3 \times .

thicker, softer, broad-stringy bark which is generally a light red-brown color with a thin white bloom. The total aspect of these trees is reminiscent of *Juniperus flaccida* though not in technical details. C and D show the other extreme of branching where the branches are longer than wide and with markedly acute angles. The bark is dark, hard, narrow-stringy with scattered white to gray bloom. These trees are similar in aspect to *Juniperus durangensis*. All specimens seen have the pale green foliage with bright glaucous bloom and homogeneous fruits and seeds.

Figure 2 shows tracings of leaf margins as seen under a 10× hand lens, the pattern readily observable in the field. The teeth of *Juniperus durangensis* leaves shown in Figure 2, A are more uniformly spaced and at relatively right angles, i.e., more dentate, while those of *J. saltillensis* (fig. 2, B) are clumped and serrate, and those in *J. flaccida* (fig. 2, C) are fewer, less pronounced, and more irregular. A look at Figure 3 will show the structural bases of the marked differences in leaf margins. In *J. saltillensis* (fig. 3, A) the teeth are seen to be outward projections of the proximal tips of the marginal epidermal cells which form an acute angle to the leaf mid-rib. In *J. durangensis* (fig. 3, B) the teeth are median projections of cells which are either vertical or irregular in orientation, while in *J. flaccida* (fig. 3, C) the teeth are mere proximal bumps on angled cells interrupted by occasional stretches of vertical marginal cells without projections.

Figure 4 shows long-shoot and short-shoot leaf types for the three species. In *J. durangensis* (fig. 4, A) the short-shoot leaves show the pronounced "string-of-beads" effect; in *J. saltillensis* (fig. 4, B) the most distinctive feature is the long, wide teardrop gland of the long-shoot leaves. *J. flaccida* (fig. 4, C) is entirely decussate in its leaf arrangement and with long slender glands.

Figures 5, 6, and 7 show the berry-cones, male-cones, and seeds of the three species. The berry-cones show 2-ranks of decussate scales in both *J. durangensis* and *J. saltillensis* and 3-ranks of decussate scales in *J. flaccida*. In *J. durangensis* the berry-cones are small, wider than long and angled toward a box-like shape; *J. saltillensis* has slightly larger berry-cones which are nearly spherical to slightly longer than wide, smooth, and very bloomy. In *J. flaccida* the berry-cones are large, nearly twice larger than in *J. durangensis*, longer than wide, smooth, with the cone scale outlines or margins clearly showing. The microsporangiate cones are eglandular in *J. durangensis* and *J. saltillensis* but with narrow, long glands in *J. flaccida*. In *J. saltillensis* the cone scales are strongly keeled toward the tip, either rounded abruptly or mucronate, while in *J. durangensis* they are not keeled but merely rounded and have acute tips.



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