

Species Descriptions, Distribution Maps and Photos rev. 8-01-08

J. communis through *J. excelsa*

Juniperus communis L.

A study of Arctic populations of *J. communis* (Adams et al., 2003), revealed (Figure 5.4) that these Arctic populations clustered by continent with the populations in Greenland and Iceland showing the highest affinities to populations from Europe, not those from North America. The North American populations were all *J. c.* var. *depressa*, whereas the eastern hemisphere populations included *J. c.* var. *communis* (CC), *J. c.* var. *saxatilis* (GR, IC, SW, UR, KA). Adams et al. (2003) concluded that the post-Pleistocene populations on Greenland and Iceland came from Europe and not North America.

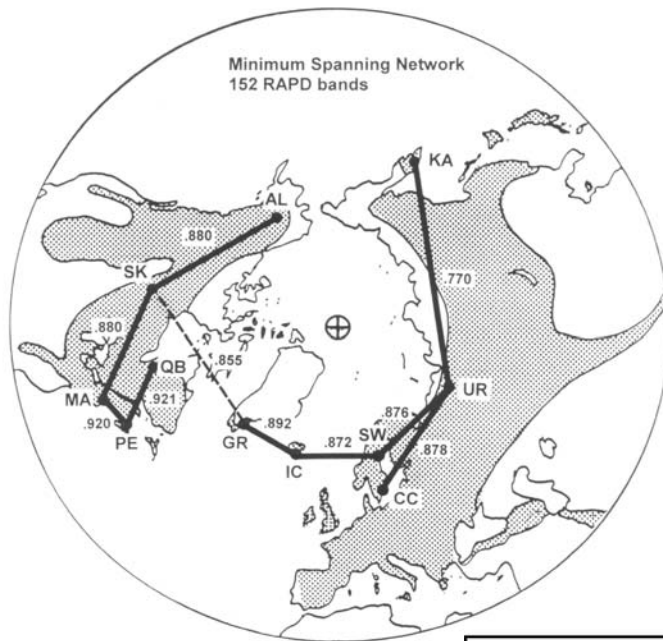


Figure 5.4. Minimum spanning network showing that all the North American *J. communis* populations link together and all the *J. communis* populations from the e. hemisphere link together.

Analysis of the currently named *Juniperus communis* varieties (Adams and Pandey, 2003), resolved these taxa (Fig. 5.5) into six major groups: *J. communis* from Europe and central Asia (*J. communis* L. var. *communis*, *J. c.* var. *depressa* Pursh, N. America; *J. c.* var. *saxatilis* Pall.); *J. c.* var. *megistocarpa* Fern. & St. John, Quebec; *J. c.* var. *nipponica* (Maxim.) E. H. Wilson, Japan; and putative *J. c.* var. *saxatilis* Kamchatka, Russia. However, Adams and Pandey (2003) did not include *J. c.* var. *jackii*, nor putative *J. c.* var. *saxatilis* from the Pacific the Pacific northwest, USA/Canada in their analysis.

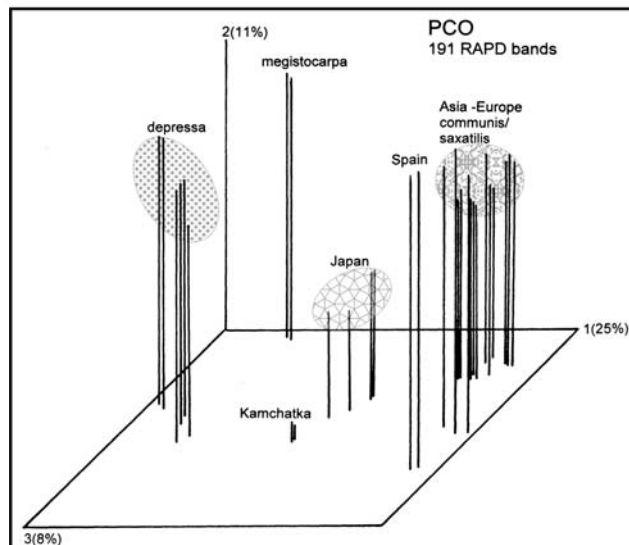


Figure 5.5 PCO based on 191 RAPD bands. Adapted from Adams and Pandey (2003).

Ashworth, et al. (1999, 2001) used DNA fingerprinting to examine *J. communis* plants identified as *J. c. var. depressa*, *J. c. var. jackii* Rehder, *J. c. var. montana* Aiton (= *J. c. var. saxatilis* Pall. see Adams, 2004) collected from California, Oregon, Nevada or Utah in the southwest and west coast of the United States. They did not get a clear pattern separating these taxa, and concluded that their samples represent a single varietal taxon. However, it not clear if they utilized population samples to remove spurious variation in RAPD bands.

The major trend (figure 5.6) among the taxa is the separation of the eastern hemisphere plants (*J. communis* var. *communis*, *J. c. var. saxatilis*, and putative *J. c. var. saxatilis*, Kamchatka) from the western hemisphere plants (*J. c. var. depressa*, *J. c. var. jackii*, *J. c. var. megistocarpa*, and putative var. *saxatilis*). The resolution (figure 5.6) of *J. c. var. jackii* (and plants from nearby Mt. Hood) is in contrast to the report by Ashworth, et al. (1999, 2001). The Banff, Alberta individuals (putative hybrids) are intermediate between the coastal, short, curved leaved plants (Queen Charlotte Islands plants, var. *jackii*) and *J. c. var. depressa* (figure 4). *Juniperus c. var. megistocarpa* is distinct from *J. c. var. depressa*.

The most interesting facet of this PCO is that Queen Charlotte Islands (*J. c. var. charlottensis*) and *J. c. var. jackii* plants do not cluster with *J. c. var. saxatilis* (Norway, mountain, figure 5.6). It appears that the short, curved leaved taxon from the Pacific northwest thence into Alaska is part of several taxa (*J. communis* var. *charlottensis*, *J. c. var. jackii* and *J. c. var. 'saxatilis'* (N. American type *saxatilis*?).

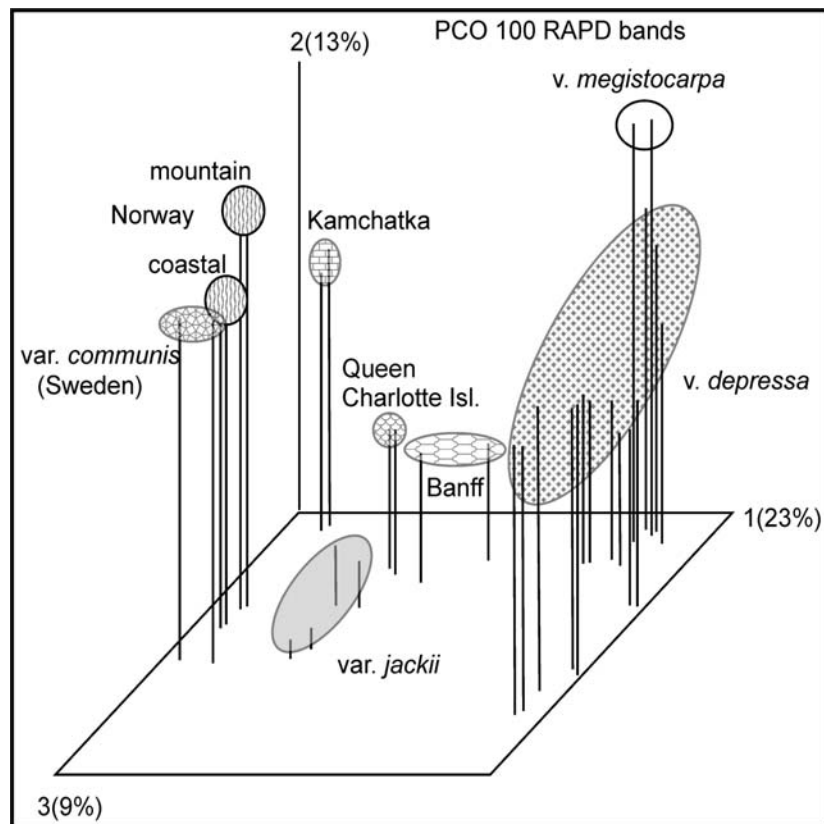


Figure 5.6. PCO based on 100 RAPD bands. See text for discussion. Adapted from Adams and Nguyen (2007).

It is possible that the Alaska (A) population was not glaciated during the Wisconsin (figure 5.7), but all the other northern populations were glaciated. Only the Alaska (D), Mt. Charleston (C) and North Carolina (NC) populations may have survived *in situ* or nearby.

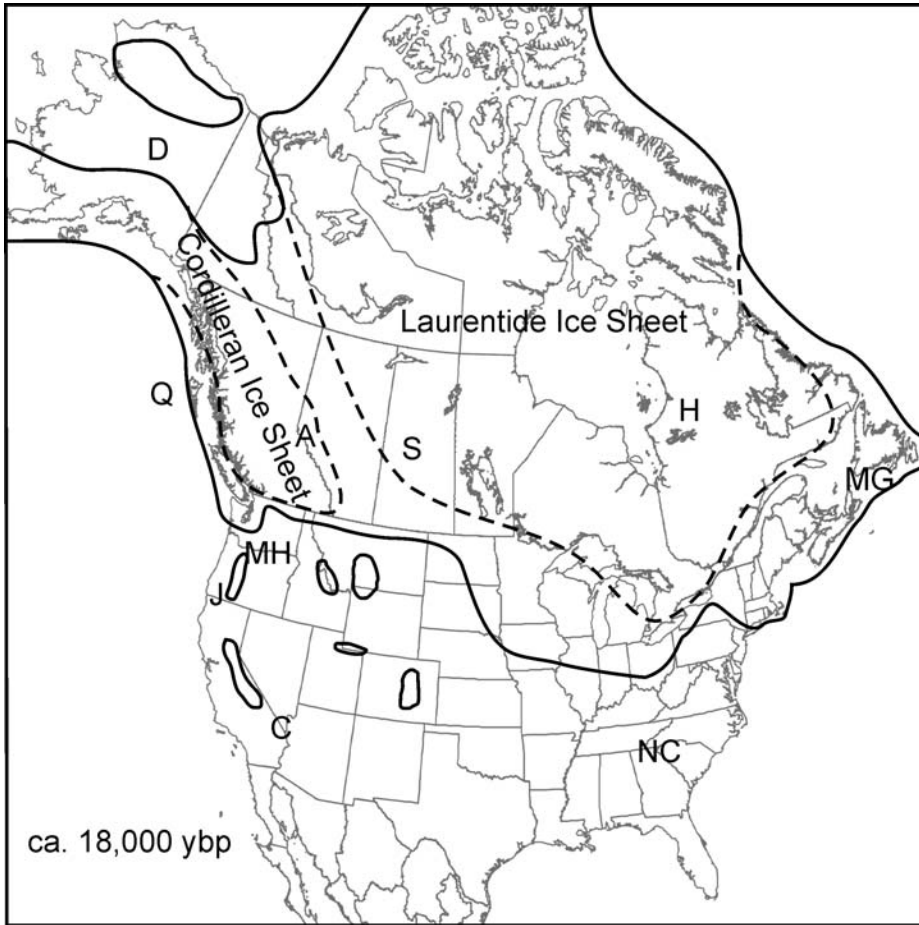


Figure 5.7. Maximal ice cover during the late Wisconsin. Notice that only the Alaska (D), Mt. Charleston (C) and North Carolina (NC) populations may have survived *in situ* or nearby.

(C) and North Carolina (NC) populations may have survived during the Wisconsin. The *J. c.* var. *jackii* populations (J, MH) likely moved to lower elevations. However, the northwestern California population of *J. c.* var. *jackii* presently occurs on serpentine, so it seems unlikely that this edaphic type grew on serpentine at a lower elevation. *Juniperus* is well known to be very adaptive to edaphic conditions, so Wisconsin era genotypes may have merely invaded the largely open habitat on the serpentine of northwestern California and southwestern Oregon.

There seem to be four possible refugia during the Wisconsin: southern Appalachian Mts. (cf. NC); southern Rocky Mountains (cf. Mt. Charleston and Arizona/New Mexico Mts.); central Sierra Nevada; and possibly an ice free corridor in central Alaska. It is easy to imagine that birds carried seeds from plants from the southern Appalachians northward into northern US and Canada. It appears more likely that the southern Appalachians were the source of germplasm in re-colonization of Canada than the southern Rocky Mountains.

Recently the North American *J. communis* taxa have been examined by use of Single Nucleotide Polymorphisms (SNPs) of nr DNA (Adams, 2008). Analyses of 1119 bp of nrDNA (ITS) sequences revealed 23 SNPs among the taxa including 2 and 4 bp deletions in *J. c.* var. *communis* and var. *saxatilis* from Norway as well as *J. c.* var. *jackii* (NW CA and Mt. Hood, OR). The 2 bp and 4 bp deletions were each coded as single deletion events in making comparisons.

Factoring the association matrix yielded five eigenroots before they began to asymptote, implying that six groups were present. These eigenroots accounted for 48.9, 15.8, 12.0, 6.9, and 5.7% of the variation among the 58 individuals analyzed. PCO of the eigenvectors (Fig. 5.8), clearly shows that the differentiation of *J. c. var. jackii* from NW CA and Mt. Hood, OR accounts for 49% of the variance among the 58 individuals. *Juniperus c. var. jackii* had 5 bp differences, plus a 4 bp deletion and a 2 bp deletion. Interestingly, the 4 bp and 2 bp deletions were shared with *J. c. vars. communis* and *saxatilis* from Norway. The Queen Charlotte Island junipers are separated by 2 bp (Fig. 5.8). These junipers grow in muskeg bogs that are very atypical of *J. communis*. An individual plant of *J. communis* found growing on a sand dune on Whidbey island has 3 mutations that separate it from all other individuals (Fig. 5.8). The leaves and habit of the plant are similar to *J. c. var. depressa*. All of the other samples (27 individuals) of *J. c. var. depressa* (N. A.) and *v. saxatilis* (Asia) form a fifth group.

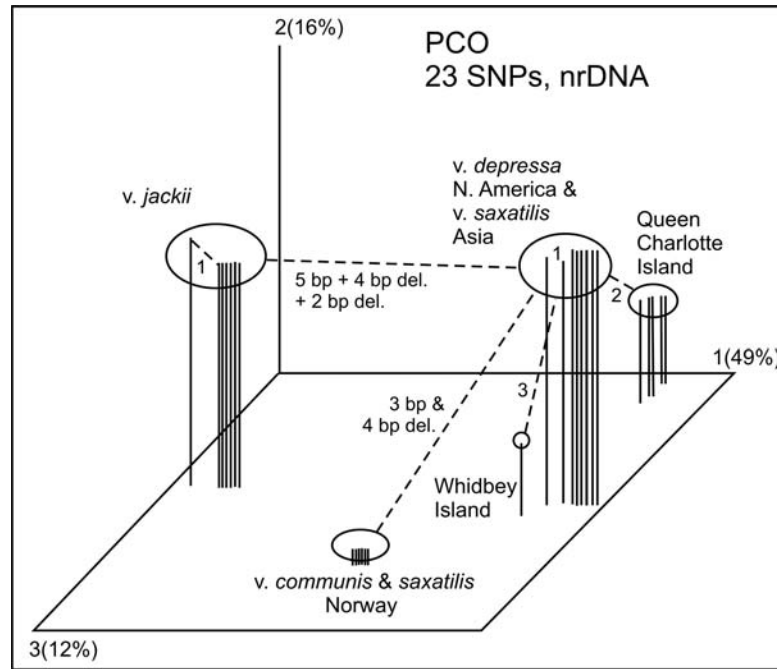


Figure 5.8. PCO of 58 individuals based on 23 SNPs. Identical bars, closely spaced indicate no variation among these individuals. The bars in the largest group are symbolic, as that group contains 27 individuals! From Adams (2008).

Because six groups were indicated by the presence of five significant eigenroots, additional variation is hidden in the PCO in figure 5.8. Therefore, the *J. c. var. jackii* individuals (NW CA and Mt. Hood, OR) were removed and

the PCO re-run. This resulted in four eigenroots accounting for 35.5, 23.7, 13.4 and 11.0% of the variance before asymptoting. This implies the presence of five groups as seen in figure 5.9. Each of the groups are separated by 2 - 3 bp (plus 4 bp and 2 bp deletion in the Norway group). The large group (27 individuals) of *J. c. var. depressa* and *J. c. var. saxatilis* is relative uniform, with only 1 bp difference between members of that group. All of the individuals that morphologically appear to be *J. c. var. saxatilis* (short, curved leaves, with a stomatal band that is twice as wide the green leaf margins) are within the large group. Therefore, the addition of '*saxatilis*' plants from NW North America to this analysis did not change the PCO in comparison with the RAPDs data.

However, it is interesting that *J. c. var. saxatilis* from Japan is within this group, in contrast to a previous RAPDs study (Adams and Nguyen, 2007). Differentiation in the nrDNA sequence was not as great as found in RAPDs. However, the pattern of considerable differentiation in the RAPDs of the *J. c. var. jackii* and Queen Charlotte Island plants (Fig. 5.6) is clearly concurrent with the nrDNA (Figs. 5.8, 5.9).

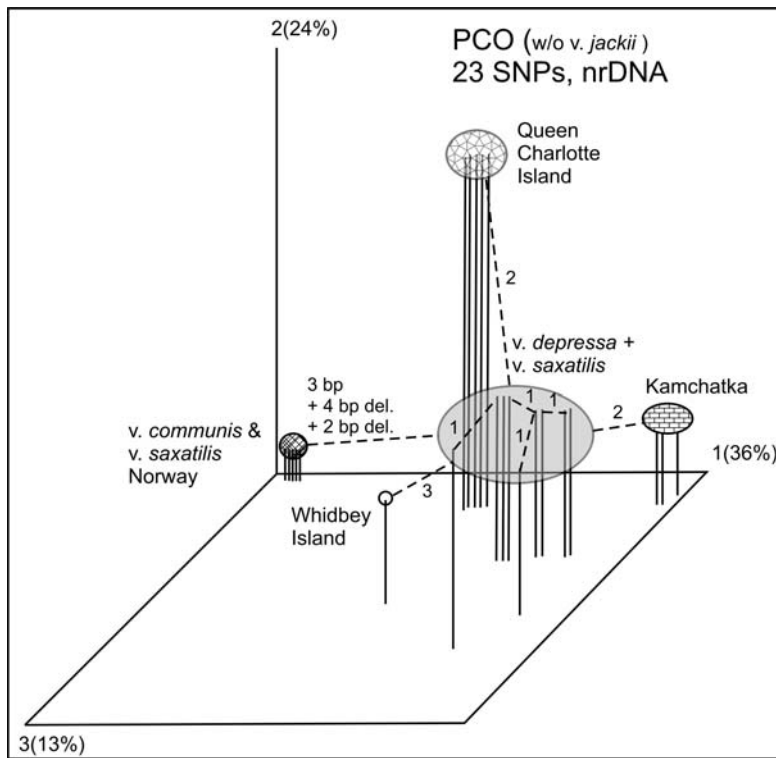


Figure 5.9. PCO of 23 SNPs of nrDNA without *J. c. var. jackii* individuals. From Adams (2008).

The recognition of infraspecific taxa of *J. communis* in North America is a difficult problem. Adams and Nguyen (2007) recognized *J. c. var. depressa*, *J. c. var. jackii* and *J. c. var. megistocarpa* based on leaves, female cones, and RAPDs data. Although the Queen Charlotte Island plants were quite distinct in their RAPDs and their habitat, it was felt that an analysis of plants from the British Columbia mainland were needed before a decision regarding their taxonomic status could be made.

Adams (2008) has shown that the Queen Charlotte Island junipers are distinct in their nrDNA from the junipers on the mainland of British Columbia. These junipers grow in a muskeg bog that is atypical of *J. communis*. Undoubtedly, this isolated population has evolved some physiological genes that enable it to cope with this environment. So in addition to divergence in RAPDs and nrDNA, there is also divergence in its physiology. Adams (2008) recognized the plants growing on muskeg on Queen Charlotte Island (and elsewhere) as a new variety: ***Juniperus communis* var. *charlottensis*** R. P. Adams.

This new variety is similar to *J. communis* var. *jackii* but differs in having seed cones that are larger and globose (vs. elongated-subglobose in var. *jackii*). This variety was discovered on Queen Charlotte Island but examination of specimens from the Ketchikan, Alaska area and islands adjacent to Queen Charlotte Island (see below) revealed that it grows on muskeg in several coastal areas. At present, the habitat seems conserved, so it does not appear to be threatened nor endangered.

In contrast to the previous study (Adams and Nguyen, 2007), Adams (2008) included putative 'var. *saxatilis*' plants from NW US and W Canada. The nrDNA SNPs analyses indicate (Figs. 5.8, 5.9) that the putative 'var. *saxatilis*' plants from North America and var. *saxatilis* from the eastern hemisphere are very similar in their nrDNA SNPs.

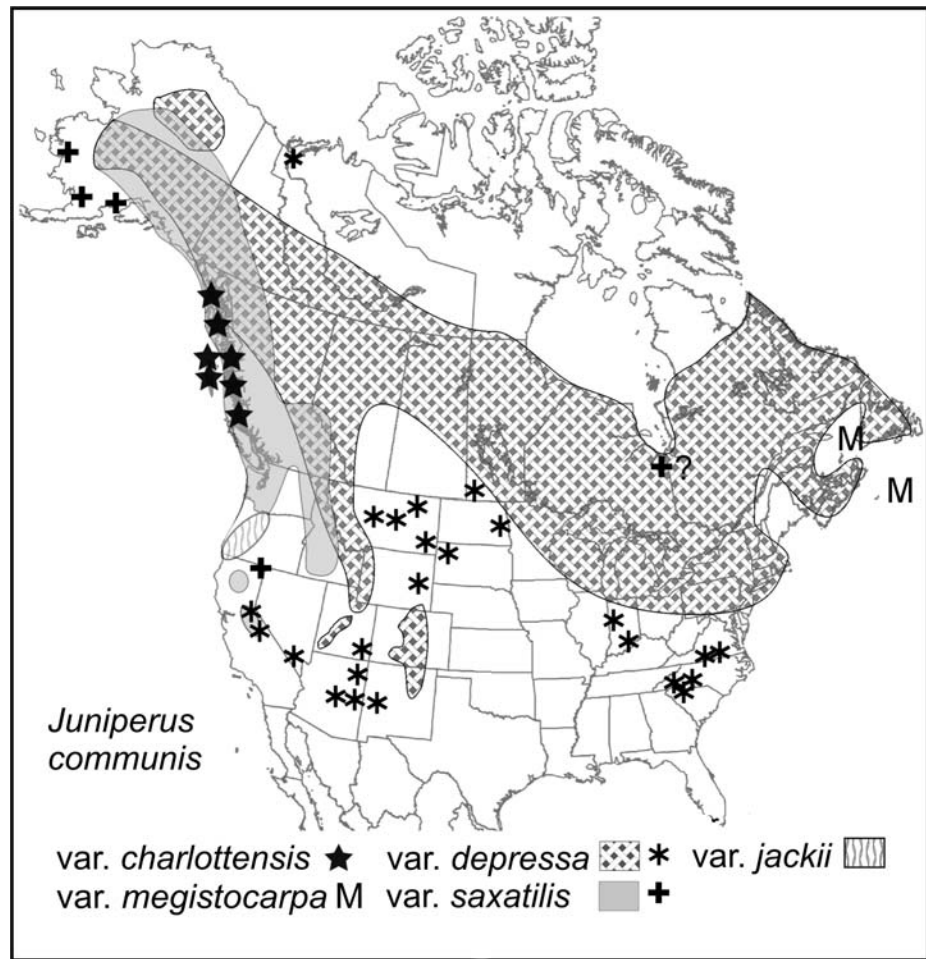


Figure 5.10. Distribution of *Juniperus communis* varieties in North America. The asterisk and plus symbols represent outlying individuals.

At present, it appears that five (5) varieties of *J. communis* merit recognition in North America: var. *charlottensis*, var. *depressa*, var. *jackii*, var. *megistocarpa*, and var. *saxatilis*. The distributions of the varieties, as presently understood, are shown in figure 5.10.

Clearly infraspecific variation in *J. communis* is very complex. This study has not completely resolved the complex variation. Additional, very detailed populational analysis will be needed to more fully understand the patterns of variation.

Key to *J. communis* varieties:

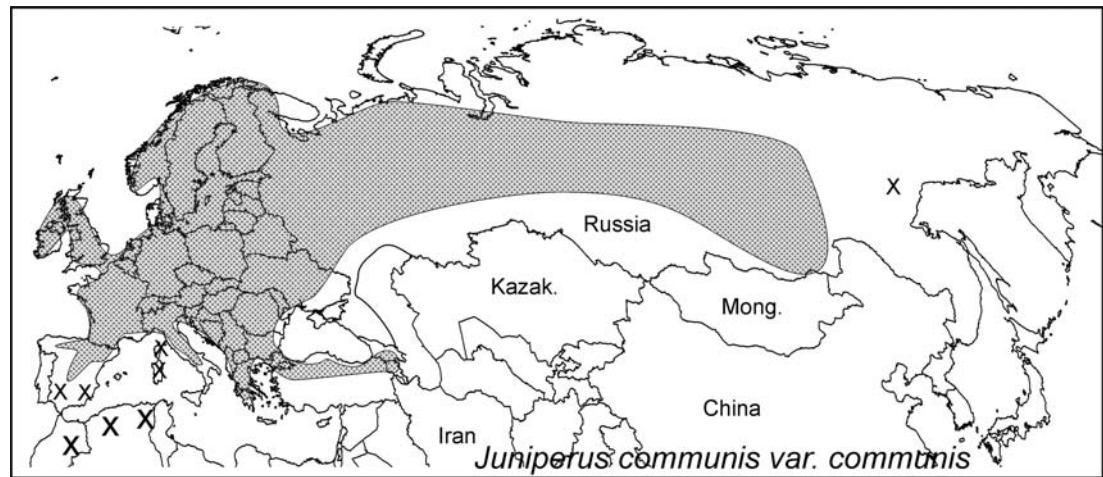
- 1a. tree or upright shrub, leaves 15 – 20 (25) mm, straight (not curved), acuminate – subulate, restricted to the eastern hemispherevar. **communis**
- 1b. prostrate or small shrub, leaves 8 -15 mm, curved (upturned), closely set, linear to linear-oblong, acuminate to subulate, in both eastern and/or western hemispheres
 - 2a. seed cones 10 – 13 mm diam., larger than leaf length, known only from southeastern Canadavar. **megistocarpa**
 - 2b. seed cones 6 – 9 mm diam., smaller than leaf length, eastern and western hemispheres
 - 3a. glaucous stomatal band about as wide to 1.5 x as wide as each green leaf margin, prostrate or low shrub with ascending branchlet tips (or occasionally a spreading shrub), leaves upturned, rarely spreading, linear to curved, western hemispherevar. **depressa**
 - 3b. glaucous stomatal band twice or more as wide as each green leaf margin, spreading, mat-like shrub (or occasionally upright), leaves upright, sometimes almost imbricate, closely set, linear lanceolate
 - 4a. mature seed cones length greater than leaf length, grows in muskeg bogs, Calvert Island to Queen Charlotte Island, and north to, Chichagof Island, Alaska.var. **charlottensis**
 - 4b. mature seed cones length less than or equal to leaf length
 - 5a. mature seed cones elongated-subglobose, stomatal band 3 to 4 times as wide as each green leaf marginvar. **jackii**
 - 5b. mature seed cones globose, stomatal band approximately 2 times as wide as each green leaf margin
 - 6a. leaves deeply concave, curved, without keel.....var. **saxatilis**
 - 6b. leaves not deeply concave, less curved, with keel, restricted to the far east: Korea, Kamchatka peninsula, Japan, southern Sakhalin Islandvar. **nipponica**

Juniperus communis L. var. *communis* Sp. Pl. 2: 1040 (1753). Common juniper. Type: (Europe, Alps?), leg. ign., (lectotype BM-HSC, see Jarvis et al., 1993).

- J. suecica* Mill., Gard. Dict., ed. 8: *Juniperus* No. 2 (1768)
J. communis L. var. *vulgaris* Aiton, Hort. Kew. 3:414 (1789)
J. communis L. var. *suecica* (Mill.) Aiton, Hort. Kew. 3:414 (1789)
J. communis L. var. *montana* Neilr., Fl. Nieder-Osterreich: 227 (1859), *non* Aiton (1789)
J. difformis Gilib., Exerc. Phytol. 2:216 (1792)
J. borealis Salisb., Prodr. Chap. Allerton: 397 (1796)
J. communis L. var. *typica* Fomin in Jaczewski, Mel. Biol. Borodine Jubile: 363 (1927), *nom inval.*, Art. 24:3
J. communis L. var. *erecta* Pursh, Fl. Amer. Sept. 2:646 (1814)
J. communis L. var. *depressa* (Steven) Boiss., Fl. Orient. 5:707 (1884), *non* Pursh (1814)
J. hemisphaerica J. & C. Presl, Delic. Prag.: 142 (1822)
J. communis L. var. *aborescens* Gaudin, Fl. Helvet. 6:301 (1830)
J. depressa Steven, Bull. Soc. Imp. Naturalistes Moscou 30:398 (1857), *non* Raf. (1830)
J. communis L. var. *oblonga* hort. ex Loudon, Arbor. Frut. Brit. 4:2490 (1838)
J. occidentalis hort. ex Carriere, Traite Gen. Conif.: 54 (1855), *non* Hook. (1840)
J. communis L. var. *hispanica* Endl., Syn. Conif.: 15 (1847)
J. communis L. var. *stricta* Carriere, Traite Gen. Conif.: 22 (1855)
J. microphylla Antoine, Cupress.-Gatt.: s.n., t. 31-32 (1857)
J. communis L. var. *hemisphaerica* (J. & C. Presl) Parl. in Candolle, Prodr. 16(2): 479 (1868)
J. communis L. subsp. *eucommunis* Syme in Sowerby, Engl. Bot., ed. 3, 8:273, t. 1382 (1868)

- J. communis* L. var. *fastigiata* Parl. in Candolle, Prodr. 16(2):479 (1868)
J. cracovia hort. ex K. Koch, Dendrol. 2(2): 115 (1873)
J. communis L. subsp. *hemisphaerica* (J. & C. Presl) Nyman, Consp. Fl. Europ. 3:676 (1881)
J. × kanitzii Csato, Magyar Novenyt. Lapok 10:145 (1886)
J. communis L. var. *genuina* Formanek, Kvet. Morav. Slezska 1:66 (1887)
J. vulgaris Tragus ex Bubani, Fl. Pyren. 1:45 (1897)
J. communis L. var. *brevifolia* Sanio in Hegii, Ill. Fl. Mitteleuropa 1:91 (1907)
J. niemanni E. L. Wolff, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 3:37 (1922)
J. oxycedrus L. subsp. *hemisphaerica* (J. & C. Presl) E. Schmid, Vierteljahresschr. Naturf. Ges. Zurich 78:237 (1933)
J. communis L. subsp. *brevifolia* (Sanio) Penzes, Bot. Kozlem. 57 (1):49 (1970)
J. albanica Penzes, Bot. Kozlem. 57 (1): 49 (1970)
J. communis L. subsp. *cupressiformis* Vict. & Sennen ex Penzes, Bot. Kozlem. 57(1): 49 (1970)
J. communis L. subsp. *pannonica* Penzes, Bot. Kozlem. 57 (1): 48 (1970)
J. communis L. var. *pannonica* (Penzes) Soo, Acta Bot. Acad. Sci. Hungarica 16 (3-4): 365 (1971)
J. communis L. f. *crispa* Browicz & Zielinski, Arbor. Kornickie 19:42 (1974)

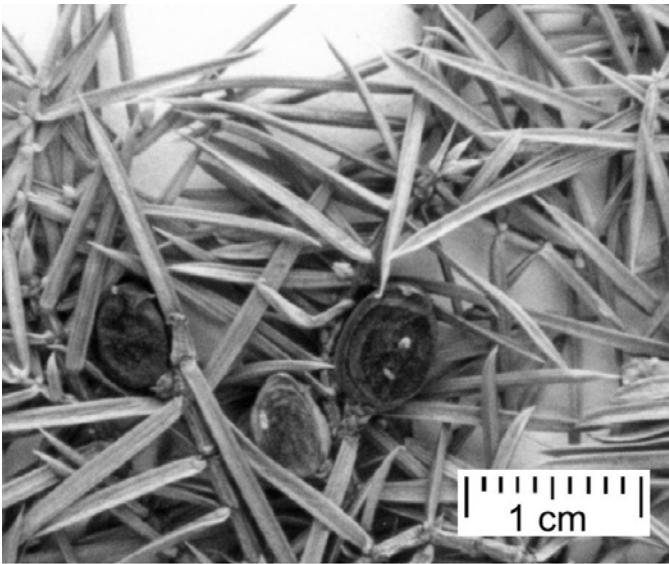
Dioecious. **Trees** to 4-5 m or shrubs. **Trunk bark** brown, exfoliating in thin strips. **Branches** stout, erect. **Leaves** acicular, 15-20 (25) mm, with a single white band above, which is rarely divided by a faint midrib in the basal half. **Seed cones** 6-9 mm, ripening in the second or third year, ovoid to globose, green the first year, then pruinose, and black when fully ripe. **Seeds** free, usually 3 per cone. $2n = 22$. **Pollen shed** spring – early summer. **Habitat** various. very adaptable from rocks, to sandy areas to old fields. **Uses** the berries are used for flavoring gin, common in cultivation for landscaping. **Dist.:** Europe to Armenia and to central Russia. **Status:** common and increasing in some areas where goats are not present. Not threatened.



Many floras recognize *J. communis* var. *hemisphaerica* (J. & C. Presl) Parl. But Adams and Pandey (2003) found that var. *hemisphaerica* from the type locality in Sicily was quite similar in its DNA fingerprints to var. *communis* (Sweden) (see Fig. 2.6, Chpt. 2). Therefore, at present, var. *hemisphaerica* is treated as synonym under var. *communis*.

J. communis var. *communis*
 bark





J. communis var. *communis*
leaves and seed cones.



J. communis var. *communis*, a small tree in
Sweden, cf. *Adams* 7846-7848



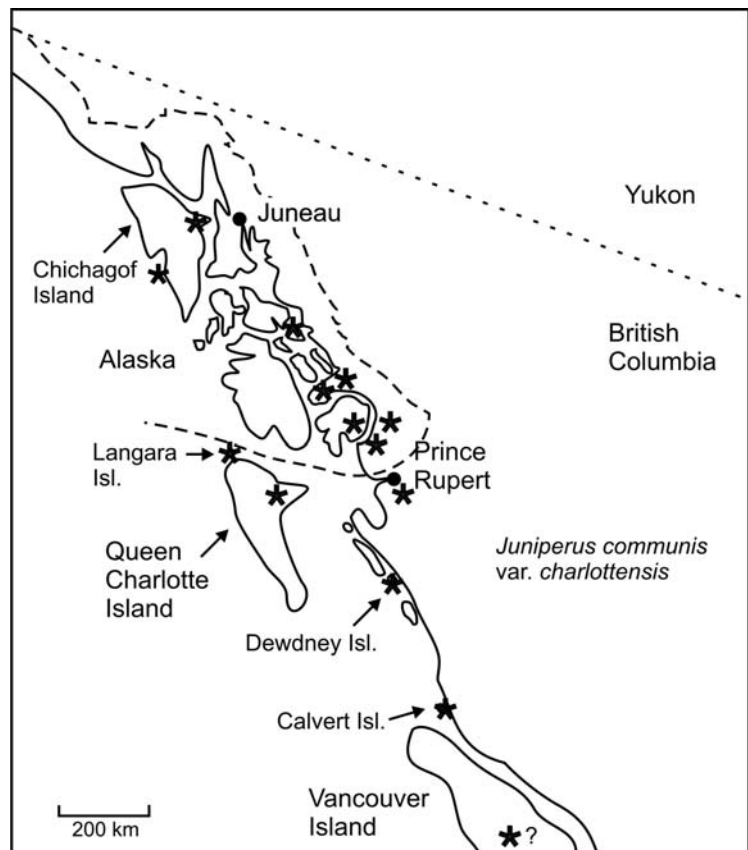
J. communis var. *communis*, tree and shrub,
Hungary, cf. *Adams* 9027-9029

Juniperus communis var. *charlottensis* R. P. Adams, *Phytologia* 90(2): 187 (2008), Queen Charlotte Island juniper. TYPE: Canada, Queen Charlotte Island, 9 km s of Masset, on hwy 16, in muskeg bog, 53° 55.511'N, 132° 06.471'W, 61m, 8-July-2007, R. P. Adams 10306 (holotype: BAYLU, paratypes: R. P. ADAMS 10304, 10305, 10307, 10308 (BAYLU)).

Diocious. Shrub, procumbent to 50 cm. **Trunk bark** thin, brown, exfoliating in strips. **Branches** upturned. **Leaves** acicular, in whorls of 3, ascending, curved, 5 - 7 x 1-2 mm, boat shaped with a single white stomatal band 2 times as wide as the green marginal bands, keeled abaxially, base jointed, not decurrent. **Seed cones** dark blue when ripe, glaucous, globose, 7-9 mm diam. **Seeds** 1-2 per cone, 3-4 mm. **Pollen shed** spring. **Habitat** muskeg bogs. **Uses** none known. **Dist.:** coastal islands and mainland coast, BC, Canada and Alaska, USA. **Status:** this taxon grows very specific areas and thus could become threatened by habitat degradation.

Additional specimens examined: **UNITED STATES, ALASKA, Chichagof Island**, about 0.5 mile NW of Whistone Harbor, on muskeg, 9 June 1981, *Mary Clay Muller* 4257 (ALA), **Mitkof Island, Petersburg**, between downtown and the airport, on muskeg, 12 Feb. 1981, *Mary Clay Muller* 4199 (ALA), **Ketchikan** area, near Ward Lake, on muskeg, 15 June 1963, *B. J. Neiland* 749 (ALA), **Misty Fjords National Monument, Smeaton Bay** area, Bakewell Trail, on muskeg, 17 July 1980, *D. E. Bramlet* B-131 (ALA), **Cleveland Peninsula, Frosty Bay**, on muskeg with sphagnum and sedges, 21 July 1982, *J. Ver Hoef* 642 (ALA), **Nakat Inlet**, 2 miles s of head inlet, in Nootka cedar/shore pine on muskeg, 8 July 1993, *J. DeLapp & M. Duffy* 93-362 (ALA), **Misty Fjords National Monument, Princess Bay**, e side, in muskeg on exposed rock, 17 July 1993, *J. DeLapp & M. Duffy* 93-548 (ALA).

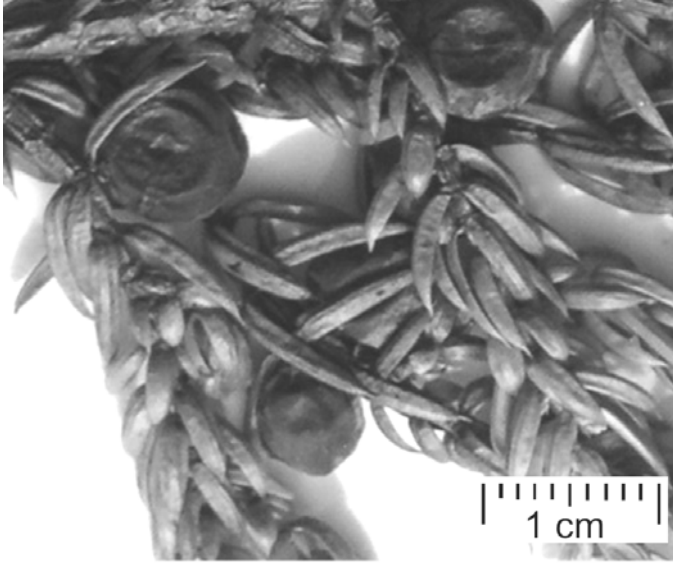
CANADA, BRITISH COLUMBIA, Khtada swamp, 60 miles sw of Terrace, 18 June 1966, *G. Mendel* 196 (V), **Calvert Island, Kwakshua**, on muskeg, 14 July 1939, *I. McT. Cowan* ns (V), **Queen Charlotte Island, Langara Island**, sphagnum bog, 21 May 1952, *F. L. Beebe* ns (V), **Dewdney Island**, w of Pemberton Bay, on rock outcrop in bog, 10 July 1984, *R. T. Ogilvie & Hans Roemer* 8471067 (V), **Vancouver Island, Green Mountain**, 35 degree slope, rocky, 1431 m, 16 July 2002, *R. Hebda, N. Hebda, L. Kennedy* 02-57 (V).



Distribution of *Juniperus communis* var. *charlottensis*. The star with a ? on Vancouver Island is the only location that putative var. *charlottensis* does not grow in a muskeg bog, but in a rocky area.

It is interesting that this variety seems to be confined to muskeg bogs that are low-lying, near the ocean. All of the specimens examined grew on muskeg or sphagnum bogs, except the unusual specimen from Green Mountain, Vancouver Island that grew on rocks at 1431 m. Whether this specimen is truly var. *charlottensis* is questionable.

The distribution of var. *charlottensis* was glaciated during the Wisconsin (Flint, 1971). Because the taxon seems restricted to muskeg bogs, it is difficult to determine a refugium for this taxon during the late Pleistocene Wisconsin glacial maximum.



J. c. var. *charlottensis*,
leaves and seed cones.

J. communis var. *charlottensis*
growing in muskeg bog,
Queen Charlotte Island, BC, Canada
cf. *Adams 10306* (holotype)



Muskeg bog habitat, Queen Charlotte
Island, BC, Canada.
cf. *Adams 10304-10308*

Juniperus communis* var. *depressa Pursh, Fl. Amer. Sept. 2:646 (1814). Depressed juniper. Type: Type: not located, (Coll. F. T. Pursh?), said to be from New York, and particularly in the province of Maine.

J. canadensis Lodd. ex Burgsd., Anleit. Sich. Erfzieh. Holzart. 2:124 (1787)

J. depressa Raf. ex M'Murtrie, Florula Louisvill, 219 (1819)

J. depressa (Pursh) Raf., Med. Fl. 2:13 (1830)

J. communis L. var. *canadensis* (Lodd. ex Burgsd.) Loudon, Arbor. Frut. Brit. 4:2490 (1838)

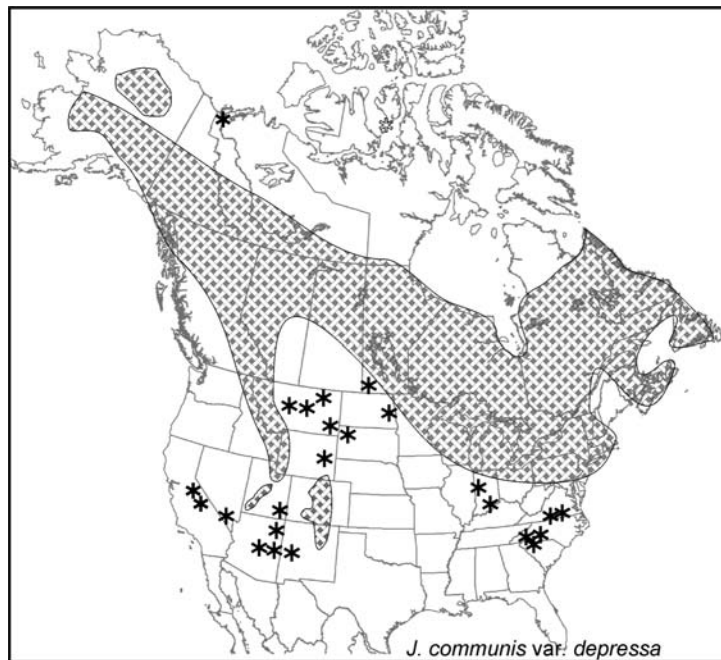
J. intermedia Schur. Verh. Mitth. Siebenburg. Vereins Naturwiss. Hermannstadt 2:169 (1851)

Sabina multiova Goodwyn, Amer. Botanist 37(4): 152 (1931)

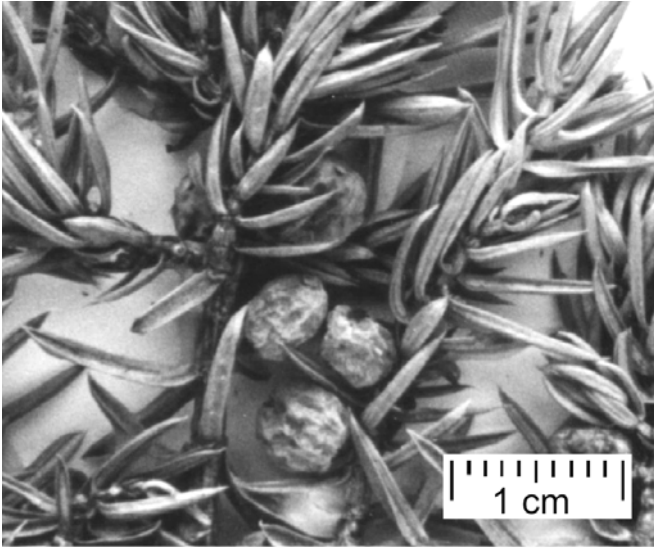
J. communis L. subsp. *depressa* (Pursh) Franco in Bol. Soc. Broteriana Ser. 2, 36:117 (1962)

J. communis subsp. *depressa* (Pursh) E. Murray

Dioecious. Prostrate or low shrubs with ascending branchlet tips (or occasionally a spreading shrub to 3 m). **Trunk bark** brown, exfoliating in wide strips or plates. **Branches** erect to ascending. **Leaves** acicular, upturned, rarely spreading, linear, acuminate, tips acute to mucronate, to 15 x 1.6 mm. Glaucous stomatal band approx. as wide as each green leaf margin. **Seed cones** 6-9 mm, smaller than leaf length. $2n = 22$ (Hall, Mukherjee and Crowley, 1979). **Seeds** 3 per cone. **Pollen shed** spring. **Habitat** Rocky soil, rocky slopes and summits, sea level to 2800 m due to latitudinal range. **Uses** none known. **Dist.:** Canada, all provinces; Alaska, Ariz., Calif., Colo., Conn., Ga., Ill., Ind., Idaho, Md., Mich., Minn., Mont., Maine, Mass., N.C., Nev., N. Dak., N.H., N. Mex., N.Y., Ohio, Oreg., Pa., R.I., S.C., S. Dak., Utah, Va., Vt., Wash., Wisc., Wyo. **Status:** common and expanding into disturbed areas. Not threatened.



J. communis var. *depressa*
bark



J. communis var. *depressa*,
leaves and seed cones.



J. communis var.
depressa, on
granite (exposed
from the Glacial
shield),
Nemeiben Lake,
Saskatchewan,
Canada
cf. *Adams*
7094-7095

J. communis var. *depressa*,
Cedar Breaks National
Park, Cedar City, Utah
USA
cf. *Adams* 10361



Juniperus communis var. *jackii* Rehder Mitt. Deutsch. Dendrol. Ges. 1907 (16): 70 (1907). Type: Siskiyou Mtns., on the road from Waldo, Oregon to Crescent City, CA, 3000 ft., 25 Aug., 1904, J. G. Jack (*A. Rehder*) s. n., (lectotype: A!, designated by Farjon (2005). Named in honor of J. G. Jack.

Dioecious. procumbent, to 20 cm. **Trunk bark** thin, brown, exfoliating in strips. **Branches** procumbent, elongated. **Leaves** acicular, in whorls of 3, ascending, curved, (6) 7 - 9 (10) x 1-2 mm, concave adaxially with a single white stomatal band 3 or 4 times as wide as the green marginal bands, keeled abaxially, base jointed, not decurrent. **Seed cones** dark blue when ripe, glaucous, elongated, subglobose, 7-9 mm long. **Seeds** 1 (2) per cone, 3-4 mm. **Pollen shed** spring. **Habitat** serpentine and lava (ultramafic rocks). **Uses** none known. **Dist.:** Serpentine rock in OR and lava (Mt. Hood, OR). **Status:** this taxon grows very specific areas and thus could become threatened by habitat degradation.

The type locality is on serpentine, but var. *jackii* grows on a variety of ultramafic rock including high elevation lava (Mt. Hood, OR).



The precise distribution of *J. c.* var. *jackii* is not known, but both confirmed localities are within the ellipse.

The type locality is from south-most corner on the CA-OR boundary. Mt. Hood, another confirmed location is near the northern-most portion of the ellipse.

J. communis
var. *jackii*
leaves and
seed cones
The seed cones are
immature and shriveled
upon drying.





J. communis
var. *jackii*
at type locality
on serpentine
cf. *Adams 10287*

J. communis var. *jackii*
on lava at timberline
on Mt. Hood, OR
cf. *Adams 10300*

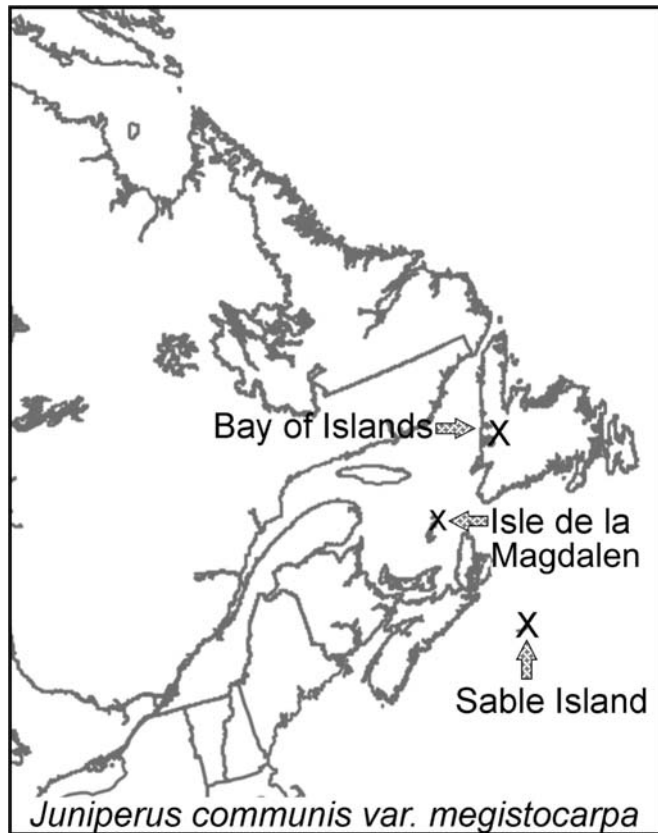


Habitat of
J. communis var. *jackii*
on serpentine
cf. *Adams 10287-10291*

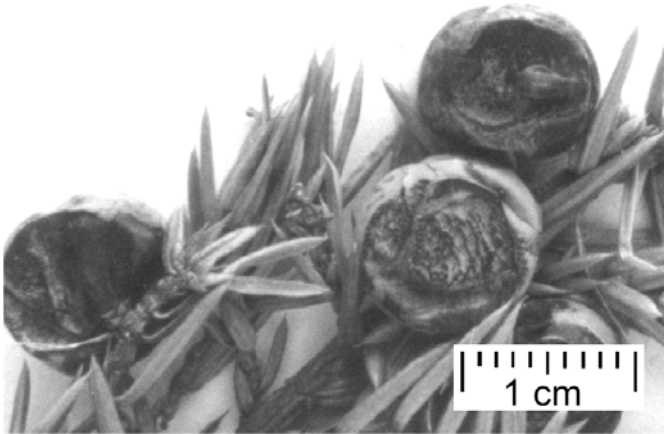
Juniperus communis L. var. *megistocarpa* Fernald & H. St. John, Proc. Bos. Soc. Nat. Hist. 36:58 (1921). Large fruited common juniper. Type: Canada, Quebec, Magdalen (Madeleine, Fr.) Islands, Alright Island, Narrows, *M. L. Fernald (with B. H. Long) 6729*, (holotype GH!)

Dioecious. Prostrate shrubs. Trunk bark cinnamon, exfoliating in wide strips or plates. **Branches** prostrate on the ground. **Leaves** acicular, boat shaped, curved, 7 – 10 mm, stomatal band 1.5 x as wide as green leaf margins. **Seed cones** very glaucous, purple-blue, mature in 2 yrs., 9-13 mm, larger than leaf length. **Seeds** 1 – 3 per cone. **Pollen shed** spring? **Habitat** sand dunes, serpentine and limestone barrens; 0-500 m. **Uses** none known. **Dist.:** Newfoundland, N.S.: Sable Isl., Que.: Magdalen Isl. (type locality). **Status:** this is a very restricted taxon and can easily become threatened.

This is the most distinct variety of *J. communis*, in its seed cones, habitat, and DNA fingerprints, yet it appears to be of only recent (Pleistocene) origin (Adams, 2003).



J. communis var. *megistocarpa* bark



J. communis var. *megistocarpa*,
leaves and very large
seed cones (largest cones
in *J. communis* complex).



J. communis var. *megistocarpa*, on sand dunes at Magdalen Island, Quebec, Canada (type locality).
cf. *Adams* 8575-8577

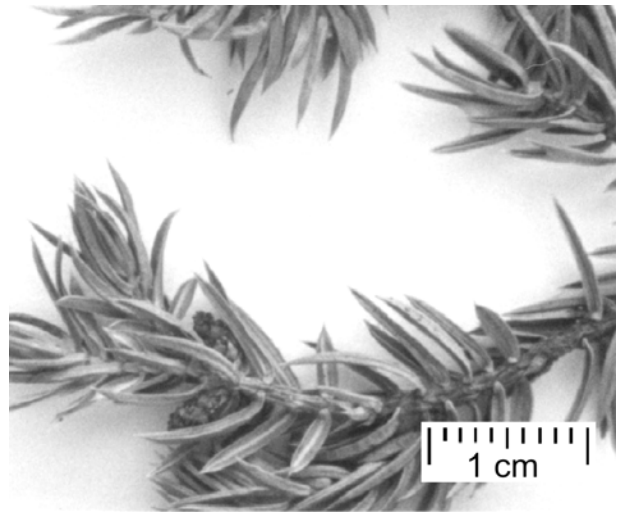
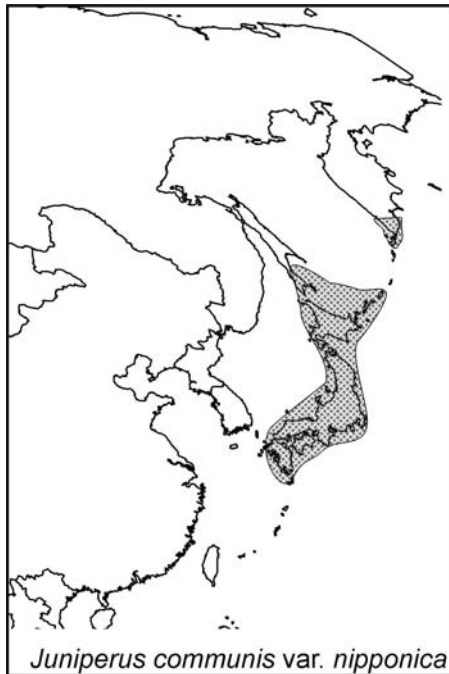
Juniperus communis var. *nipponica* (Maxim.) E. H. Wilson, Conifer and Taxads of Japan, Publ. Arnold Arbor. 8: 81 (1916). Miama-nezu, Type: Japan, Honshu (Prov. Nambu in alpinus, *Tschonoski* [ex herb. C. J. Maximowicz] s. n. (holotype: LE; isotypes BM; NY).

J. nipponica Maxim., Bull. Acad. Imp. Sci. St. Petersburg 12 :230 (1868)

J. rigida Siebold & Zucc. subsp. *nipponica* (Maxim.) Franco, Bol. Soc. Brot. ser. 2, 36: 119 (1962)

Dioecious. Procumbent shrubs. Trunk bark exfoliating strips. **Branches** yellowish brown, glabrous. **Leaves** acicular, crowded, spreading, short, linear oblong, curved, 1-1.2 mm wide, deeply grooved on adaxial (upper) surface, keeled below. **Seed cones** globose, rounded at apex, 7-9 mm, bluish-black. **Seeds** 1-3 per cone. **Pollen shed** spring. **Habitat** alpine slopes. **Uses** none known. **Dist.:** Hokkaido, Honshu, Japan and Korea, Sakhalin, Kamchatka peninsula. **Status:** the exact distribution is not known, but due to the protected areas that it occurs in and the non-economic use, it is probably not threatened.

Adams and Pandey (2003) showed that *J. communis* var. *nipponica* is somewhat distinct from vars. *communis* and *saxatilis* (see Figs. 2.6, 2.7 in Chpt. 2). For the present it is treated as distinct variety of *J. communis*.



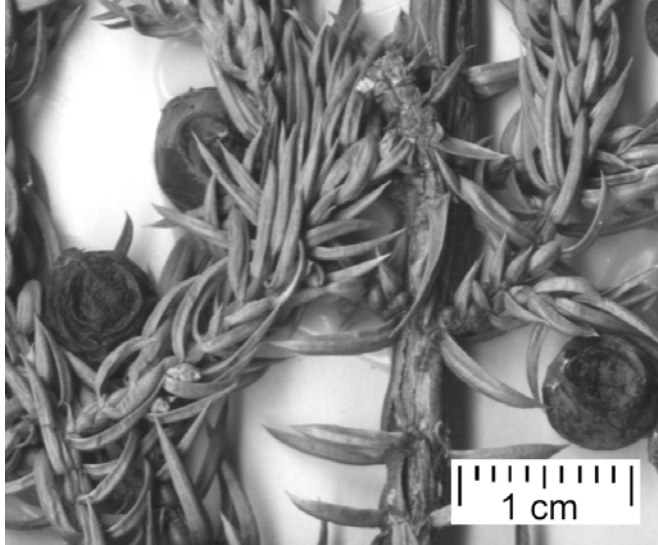
J. communis var. *nipponica*, leaves and male cones.

***Juniperus communis* L. var. *saxatilis* Pall.**, Fl. Ross. 1 (2): 12 (1789). Rocky juniper Type: none, (lectotype: Illustration in Pallas, Fl. Rossica 1(2): 12, t. 54 (1789), designated by Farjon (p.271, 2005). Farjon notes (p. 274, 2005) "The validation of Pallas' name remains somewhat problematic because strictly speaking the plate lacks diagnostic features (details) and the description is unclear".

- J. sibirica* Bursd., Anleit. Sich. Erzieh. Holzart. 2:124 (1787)
J. nana Willd., Berl. Baumz.: 159, *nom. nud.* (1796)
J. communis L. var. *montana* Aiton, Hort. Kew 3:414 (1789)
J. communis L. var. *alpina* Suter, Fl. Helvet. 2:292 (1802)
J. oblonga M.-Bieb., Fl. Taur.-Cauc. 2:426 (1808)
J. communis L. var. *nana* (Willd.) Baumg. Enum. Stirp. Transsilv. 2:308 (1816)
J. alpina S. F. Gray, Nat. Air. Brit. Pl. 2: 226 (1821)
J. communis L. var. *oblonga* (M.-Bieb.) Parl. in Candolle, Prodr. 16 (2): 479 (1868), *non* Loudon (1838)
J. communis L. var. *caucasica* Endl., Syn. Conif.: 16 (1847)
J. nana Willd. var. *alpina* (Aiton) Endl., Syn. Conif.: 14 (1847)
J. pygmaea K. Koch, Linnaea 22:302 (1849)
J. montana (Aiton) Lindl. & Gordon, J. Hort. Soc. London 5:200 (1850)
J. caesia Regel. Gartenflora 6:346 (1857), *non* Carriere (1855)
J. communis L. subsp. *alpina* (Suter) Celak., Prodr. Fl. Bohmen: 17 (1867)
J. communis L. subsp. *nana* (Willd.) Syme in Sowerby, Engl. Bot., ed. 3, 8:275, t. 1383 (1868)
J. communis subsp. *alpina* (Smith) Celakovsky (1869)
J. sibirica Bursd. var. *montana* (Aiton) Beck, Blatt. Verein. Landesk. Niederosterreichs 1890: 78 (1890)
J. rebunensis Kudo & Suzuki, Med. Pl. Hokaido, No. 6, t.6 (1920)
J. communis L. subsp. *oblonga* (M.-Bieb.) Galushko, Mat. Izucheniya Stavrop. Kraja 2-3:165 (1950)
J. communis L. subsp. *saxatilis* (Pall.) E. Murray, Kalmia 12:21 (1982)
J. communis L. subsp. *pygmaea* (K. Koch) Imkhan., Novosti SSt. Vyssh. Rast. 27: 10 (1990)

Dioecious. Shrubs procumbent, to 70 cm. **Trunk bark** thin, cinnamon to brown, exfoliating in wide strips. **Branches** procumbent, densely arranged, 3-angled, thick, ca. 2 mm in diam. **Leaves** acicular, in whorls of 3, ascending, lanceolate or linear, usually subfalcate, 4-10 x 1-2 mm., slightly concave adaxially with a single white stomatal band broader than green marginal bands, keeled abaxially, base jointed, not decurrent. **Seed cones** brownish black when ripe, glaucous, globose or subglobose, 4-7 mm in diam. **Seeds** 1-3 per cone, 3-4 mm. **Pollen shed** late spring. **Habitat** rocky areas. **Uses** female cones ('berries') used to flavor gin. **Dist.:** Mountain areas: 600-2400 m. Europe, Russia, Mediterranean, C and W Asia to W. Himalaya, Korea, Japan, Mongolia, Russia. **Status:** this taxon is widespread so it seems robust.





J. communis var. *saxatilis*, bark

J. communis var.
saxatilis,
Norway
cf. *Adams* 11196-
11200



J. communis var. *saxatilis*,
Somosierra, Spain, N. of Madrid.
cf. *Adams* 10373-10377

Juniperus compacta (Mart.) R. P. Adams, Phytologia 89(3): 368 (2007), Basionym: *Juniperus monticola* Martinez f. *compacta* Martinez, Bol. Soc. Bot. Mexico 7: 19 (1948). Compact mountain juniper. Type: Mexico, Volcano Popocatepetl, *M. Martinez* 7003 (holotype: MEXU!).

Cupressus sabinoides H.B.K., Nova Gen. et Sp. Pl. 2:3. 1817.

J. mexicana Sprengel, Syst. Veg. 3: #909 (1826), *nom. superfl. illeg.*

J. sabinoides (Kunth) Nees. Linnaea 19: 706 (1847), *non* Griseb., Spec. Fl. Rumel.

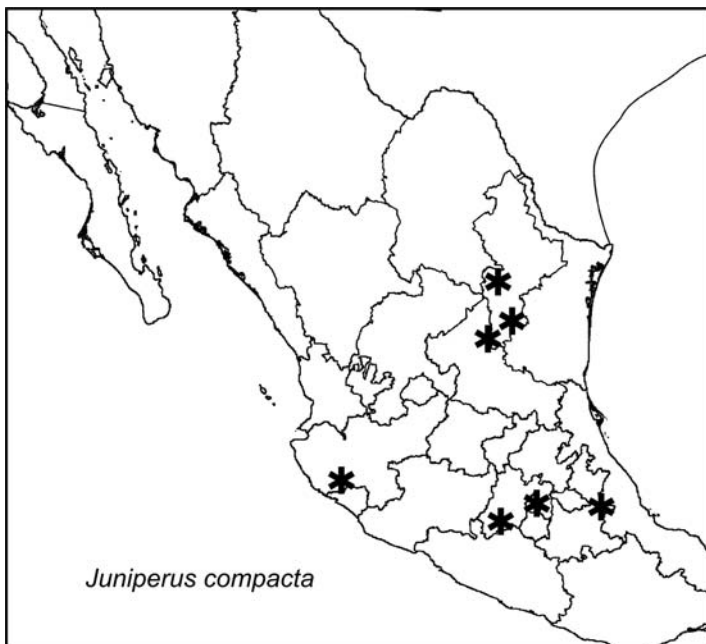
2: 352 (1846).

J. sabinoides Humb. (erroneously attributed) in Lindley and Gordon, J. Hort. Soc. 5: 202 (1850).

J. monticola Martinez var. *monticola* f. *compacta* Martinez, Bol. Soc. Bot. Mexico 7:19 (1948).

J. monticola Martinez subsp. *compacta* (Martinez) J. Silba, J. Int. conifer Preserv. Soc. 13(1): 12 (2006).

Dioecious. Prostrate shrubs with twisted branches forming mats (to 1 m high). **Trunk bark** cinnamon brown, exfoliating in thin strips. **Branches** procumbent. **Leaves** decurrent (whip) and scale-like, foliage very densely compacted; angle of branching of ultimate twig 50-60 degrees mature ultimate twigs 5-10 mm long. **Seed cones** female cones with soft, fleshy pulp, globose or gibbous, dark bluish-black, with a light coat of bloom. 5-9(-10) mm diameter, peduncles usually curved. **Seeds** (2-)3-7(-9) per cone, usually angular and grooved, hilum about 0.5 to 0.6 length of seed. **Pollen shed** fall. **Habitat** at edge of pine forest treeline (about 3000 m elevation); or above treeline (alpine) in mountain grasslands of *Calamagrostis* and *Festuca*, usually in rocky crevices, or on rocky outcrops at 3000-4300 (-4500) m elevation. **Uses** none known. **Dist.:** Sierra Mojada, Coahuila; Cerro Pelado and Ajusco, Distrito Federal; Nevado de Colima, Jalisco; Popocatepetl, Iztaccihuatl, Tlaloc and Nevado de Toluca, Mexico; Cerro Potosi, Nuevo Leon; Malinche, Tlaxcala; and Cofre de Perote, Vera Cruz; Mexico. **Status:** This form is found in very scattered, alpine areas. Because it is a small shrub of no economic importance and these areas are not suited for pasture, it is likely not threatened.



J. compacta, bark



J. compacta
leaves and seed cones



J. compacta, Cerro Potosi, (foreground) with *Pinus culminicola* (background) and Walter Kelley. photo by T. A. Zanoni.

T. A. Zanoni collecting samples of the prostrate shrub, *J. compacta*, Cerro Potosi, Nuevo Leon, 3490 m, with *Pinus culminicola* (larger shrubs).



J. compacta, Nevada de Toluca, Mexico. photo by T. A. Zanoni

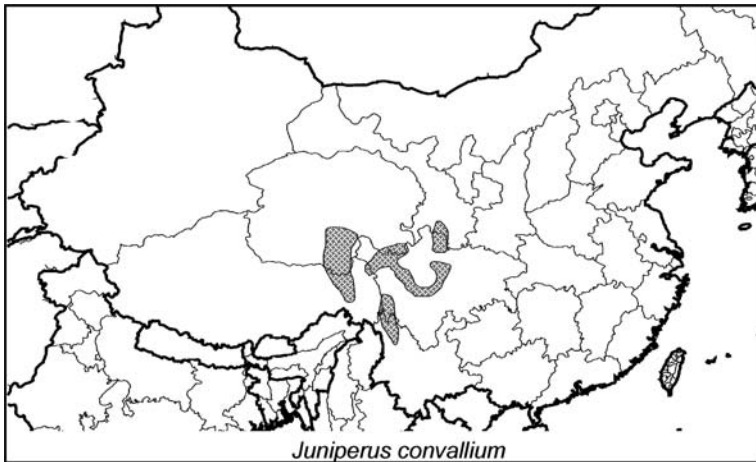
Juniperus convallium Rehder & Wils. in Sargent, Pl. Wilson 2:62 (1914). Mi zhi ynan bai
Type: China, Sichuan, NW Sichuan, *E. H. Wilson 3010* (holotype A!, isotypes BM, K).

J. mekongensis Kom., Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 5: 28 (1924)

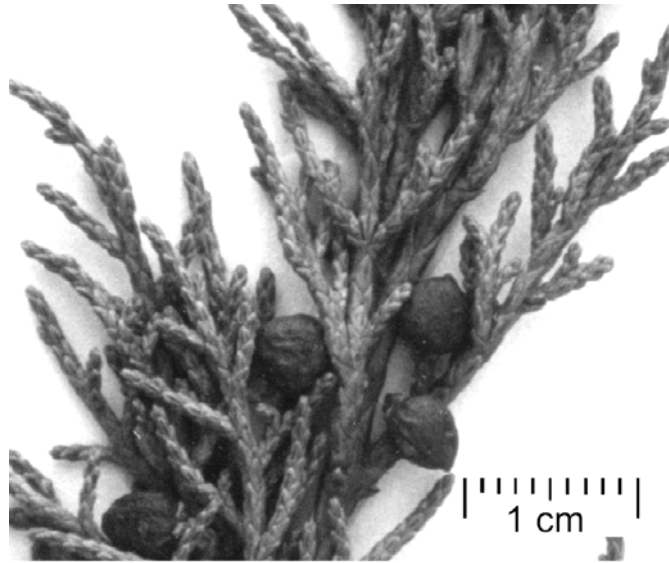
J. ramulosa Florin, Acta Hort. Gothoburg. 3: 5 (1927)

Sabina convallium (Rehder & Wils.) W.C. Cheng & L.K. Fu, FL. Reipubl. Pop. Sin. 7: 372
(1978)

Dioecious or monoecious. **Trees** rarely shrubs, branchlets densely arranged, straight or curved, terete, rarely slightly 4-angled, thin, ultimate ones usually about 1 mm in diam. **Trunk bark** cinnamon, exfoliating in thin plates. **Branches** erect. **Leaves** grayish green, both scale and decurrent (whip); decurrent leaves present only on young plants, decussate or in whorls of 3, ascending, 3-8 mm, concave adaxially; scale leaves decussate, rarely in whorls of 3, closely appressed, 1.5-2 x 0.8-1 mm. abaxial gland near center, convex or concave. **Seed cones** reddish brown to purplish black when ripe, glaucous or not, terminal on short, curved or erect branchlets, ovoid, conical-ovoid, or globose, 5-8(-10) x 5-6 mm. **Seeds** 1 per cone, conical-globose or flattened ovoid, 3-5 mm in diam., with or without resin pits. **Pollen shed** spring. **Habitat** high mountains. **Uses** incense. **Dist.:** central western China, see map. **Status:** LRnt. The distribution is rather limited and the populations generally small. This taxon may become threatened.



J. convallium bark



J. convallium, leaves and seed cones.



J. convallium, Sichuan, China,
cf. *Adams* 8525-8527



J. convallium on hillside, Sichuan, China, cf. *Adams* 8525-8527

Juniperus coxii A. B. Jacks, New Fl. & Silva 5:33 (1932). Coffin juniper, xiao guo chui zhi bai
 Type: England, cultivated in Exbury Gardens, Hampshire, from R. Farrer & E. H. M. Cox,
 1407 collected in Myanmar (Burma), Chimili Valley (26.3N 98.6E) in 1920, R. Farrer 1407
 (holotype K!)

J. recurva Buch.-Ham. ex D. Don var. *coxii* (A. B. Jacks.) Melville, Kew Bull. 1958: 533 (1959)

Sabina recurva (Buch.-Ham. ex D. Don) Antoine var. *coxii* (A.B. Jacks.) W. C. Cheng & L.K.

Fu, Fl. Reipubl. Pop. Sin. 7:352 (1978)

Dioecious. **Trees** to 10-12 m, or large shrubs. **Trunk bark** brown to cinnamon, exfoliating in wide strips or plates. **Branches** branchlets long, pendulous. **Leaves** decurrent and scale (often becoming somewhat decurrent), 6-10 mm. adaxial surface of leaves with 2 greenish white stomatal bands and a prominent, green midvein. **Seed cones** turbinate, greenish brown, turning nearly black upon maturity in 2 yrs., 6-8 x 5-6 mm. **Seeds** 1 per cone, conical-ovoid, 5-6 x 3-4 mm, 3-ridged. **Pollen shed** spring. **Habitat** forests in high mountains. **Uses** coffins, furniture. **Dist.:** N. Burma to Yunnan, China to 3000 m. **Status:** VU, A1c. This species is vulnerable.

Juniperus coxii is often treated as *J. recurva* var. *coxii*, but Adams (2000c) showed *J. coxii* to be a little more similar to *J. pingii* than to *J. recurva* (see Fig. 3.5, Chpt. 3). Recent DNA sequencing (Schwarzbach et al., in prep.) have shown that *J. coxii* is more closely allied with *J. squamata* var. *fargesii* than with *J. recurva* (Fig. 5.11).

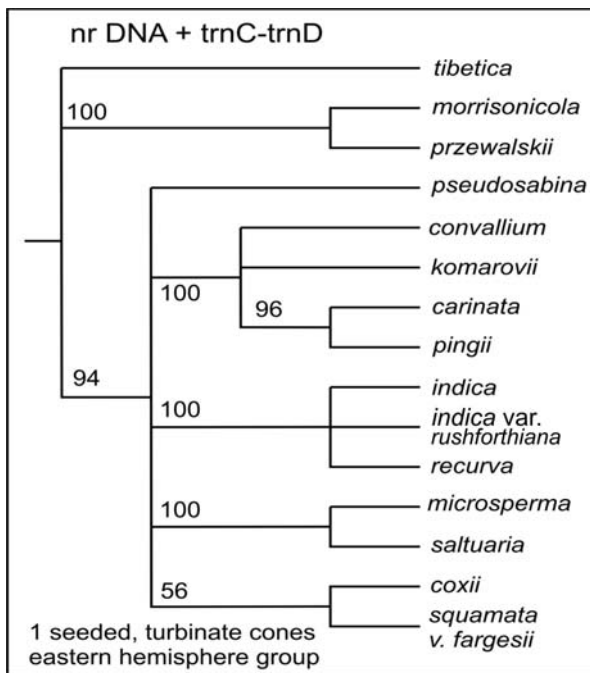


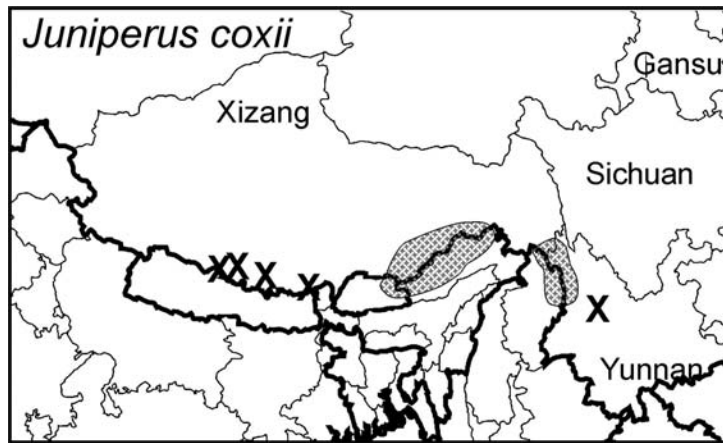
Figure 5.11. Bayesian tree based on combined nrDNA and cp trnC-trnD sequences from Schwarzbach et al. (in prep.). Notice that *J. coxii* and *J. squamata* var. *fargesii* are barely supported (56%) as a clade, but *J. coxii* was well resolved from *J. recurva*. Numbers above the branch points are posterior probabilities on a percent basis.



J. coxii bark

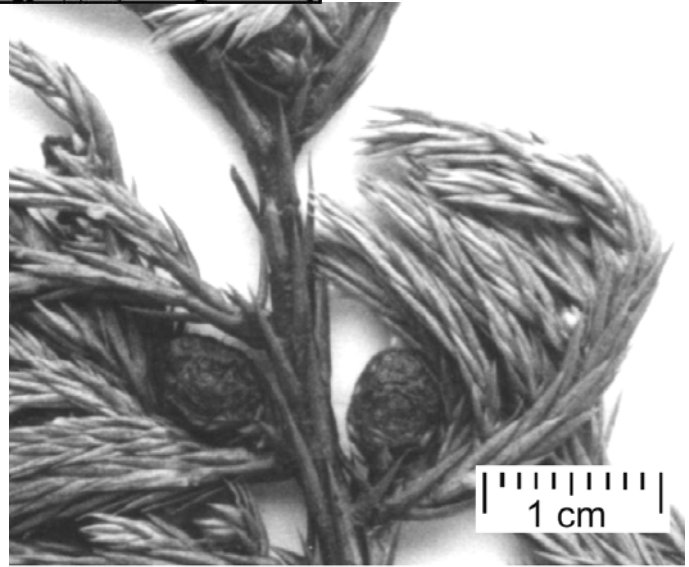


Large (~1 m DBH) *J. coxii* tree, Yunnan, China, cf. Adams 8508.



The distribution of *J. coxii*. The outlying specimens (X) are suggestive of a larger range. However, they might be mis-identified. Addition field work is needed to adequately map the distribution of *J. coxii*.

J. coxii
leaves and seed cones.



J. coxii, Yunnan, China
near the Vietnam border
cf. *Adams 8509*

This field trip in 1998 was led by Prof. Wang Fei, Kunming Botanical Garden, who passed away suddenly a few years later.

Juniperus deltooides R. P. Adams, Phytologia 86: 49 (2004). Type: Greece. 14 km e. of Arachova (Arahova), 420 m, R. P. Adams 9436 (holotype: BAYLU!)

Representative Specimens Examined. Bulgaria, s. Varna, 7Dec. 1923, B. Gilliat-Smith 373 (K).

J. oxycedrus f. *parvifolia* Novak, Preslia 4: 53 (1926)

J. oxycedrus var. *microcarpa* Neilr., Veg. Croat. 52 (1968)

J. oxycedrus var. *parvifolia* (Novak) Jovan. in Saric (ed.), Fl. Serbia 1: 218 (1992)

J. oxycedrus var. *fastigiata* Jovan. in Saric (ed.), Fl. Serbia 1: 413 (1992)

Dioecious. **Trees** to 12 m or large shrubs, often with pyramidal crowns. **Trunk bark** cinnamon to brown, exfoliating in thin plates. **Branches** erect. **Leaves** acicular, 9-17 mm long, 1.5-2.4 mm wide, base of the leaf nearly as wide as the blade. Leaves with two glaucous bands on the adaxial surface, generally not sunken. **Seed cones** with protruding leaf scales, ripening in second year, globose, dark red when ripe, green turning to brownish yellow during ripening. **Seeds** 3-5 per cone. **Pollen shed** late spring. **Habitat** rocky areas. **Uses** wood destructively distilled to produce Oil of Cade. **Dist.:** Italy, Greece, Balkans, Turkey to Iran. **Status:** this taxon is abundant and reproducing, not threatened.

This is a cryptic species recently described (Adams, 2004) as differing from *J. oxycedrus* in its terpenes, RAPDs, leaf morphology and range. DNA sequencing supports the specific status of *J. deltooides* (Adams et al., 2005) as shown in figure 5.12.

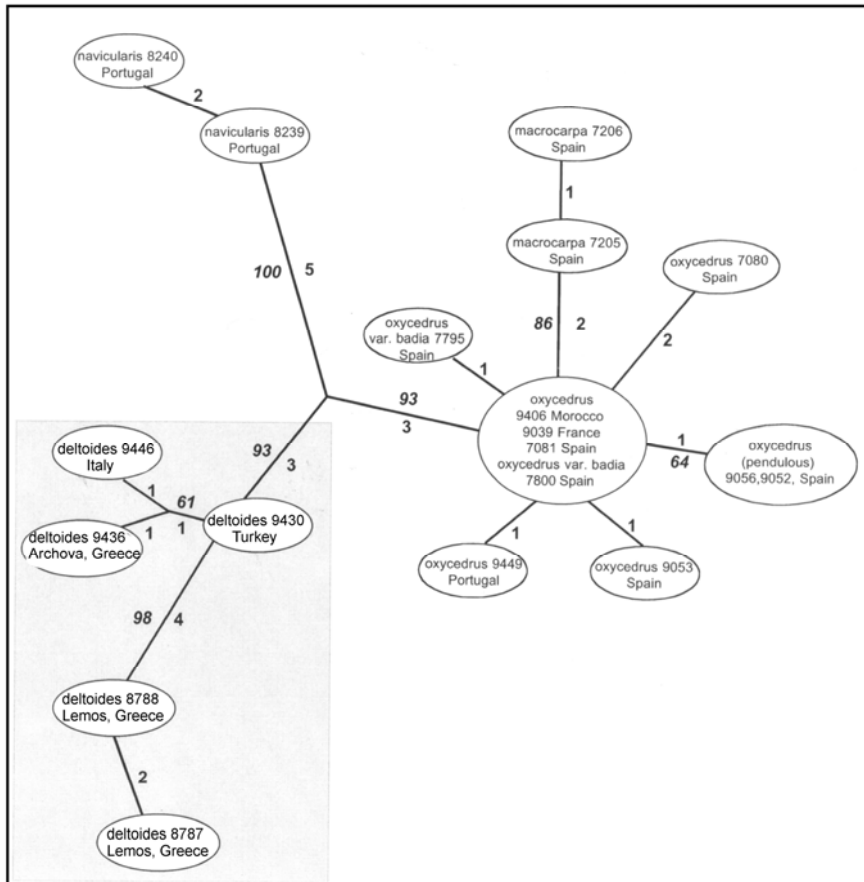


Figure 5.12. Single most parsimonious haplotype tree based on ITS sequences. The branch lengths are number of nucleotide differences between taxa. Notice the *J. deltooides* populations are well resolved from *J. macrocarpa*, *J. navicularis* and *J. oxycedrus*. From Adams et al. (2005).

In addition, the recent sequencing of *Juniperus* (Schwarzbach et al., in prep.) clearly shows that combined nr DNA and cp trnC-trnD sequences (Fig. 5.13) place *J. deltooides* and *J. oxycedrus* quite separated clades. Further given credence to the recognition of this cryptic species.

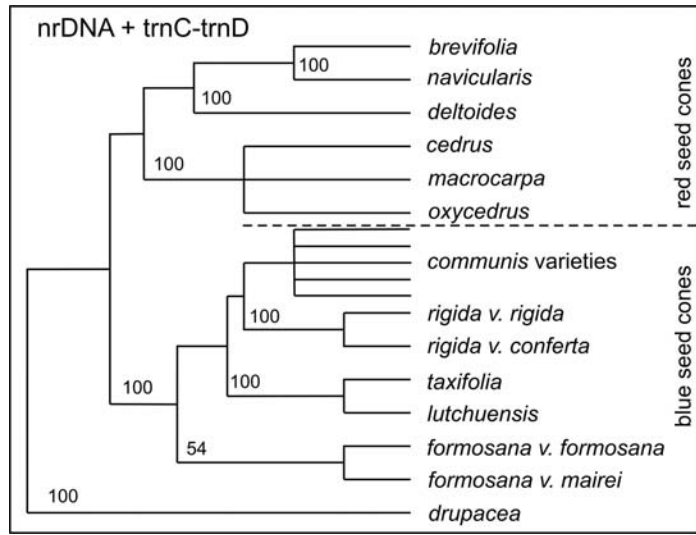
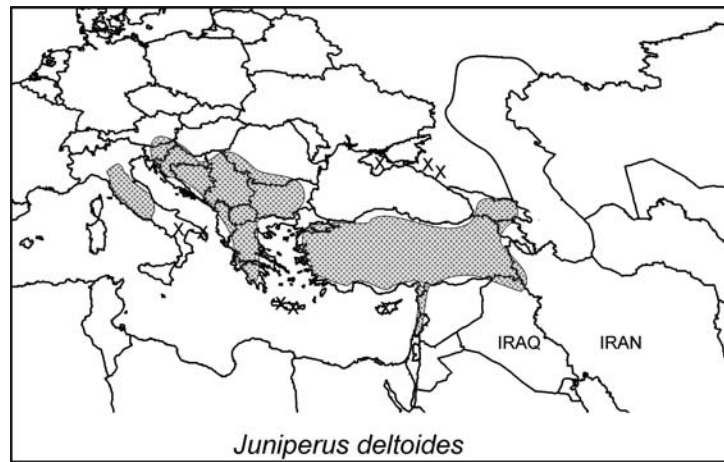


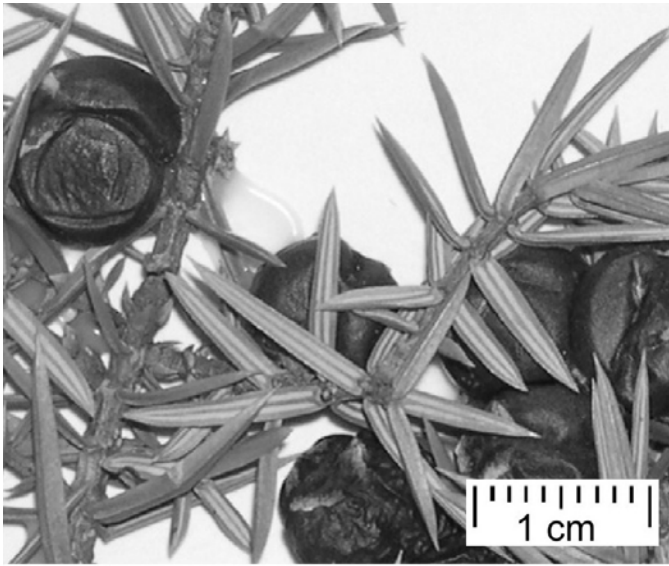
Figure 5.13. Bayesian tree based on combined nrDNA and cp trnC-trnD sequences from Schwarzbach et al. (in prep.). Notice that *J. coxii* and *J. squamata* var. *fargesii* are barely supported (56%) as a clade, but *J. coxii* will well resolved from *J. recurva*. Numbers above the branch points are posterior probabilities on percent basis.



J. deltooides, bark



J. deltooides, 30 km n of Eskisehir, Turkey
cf. Adams 9430-9432



J. deltooides,
leaves and seed
cones.

J. deltooides,
14 km e of
Arachova, Greece
cf. *Adams 9436-9438*



J. deltooides,
shrubs in Italy.
It is not known if the
shrubby form is natural
or caused by goats
browsing.
cf. *Adams 9445*

Juniperus deppeana Steudel

A recent re-examination of *J. deppeana* (Adams et al., 2006) resulted in several taxonomic changes based on new sequence data from Schwarzbach et al. (in prep.). Figure 5.14 shows a Bayesian tree based on nr DNA combined with cp trnC-trnD sequences. This data,

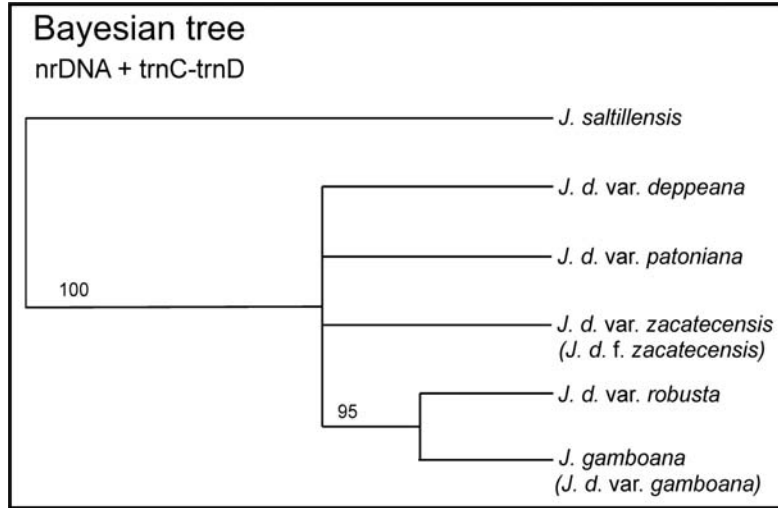


Figure 5.14. Bayesian tree based on combined nrDNA and cp trnC-trnD sequences from Schwarzbach et al. (in prep.). Numbers above the branch points are posterior probabilities on percent basis.

based on only a single accession per taxon, indicated that *J. gamboana*, a checked bark juniper, was a part of *J. deppeana* (Fig. 5.14). Based on the sequencing, terpenoids, and morphology, Adams et al. (2006) recognized *J. gamboana* as *J. deppeana* var. *gamboana* (Mart.) R. P. Adams and *J. deppeana* var. *zacatecensis* as a forma, *J. deppeana* f. *zacatecensis* (Mart.) R. P. Adams.

The distribution of *J. deppeana* and its varieties is shown in figure 5.15.

Adams, Zanoni and Hogge (1984b), using leaf terpenoids examined the varieties of *J. deppeana*. They found that samples from Arizona (BA, SA) as a group rather distinct from the other *J. deppeana* varieties.

Adams et al. (2007) expanded this research into *J. deppeana* by using DNA

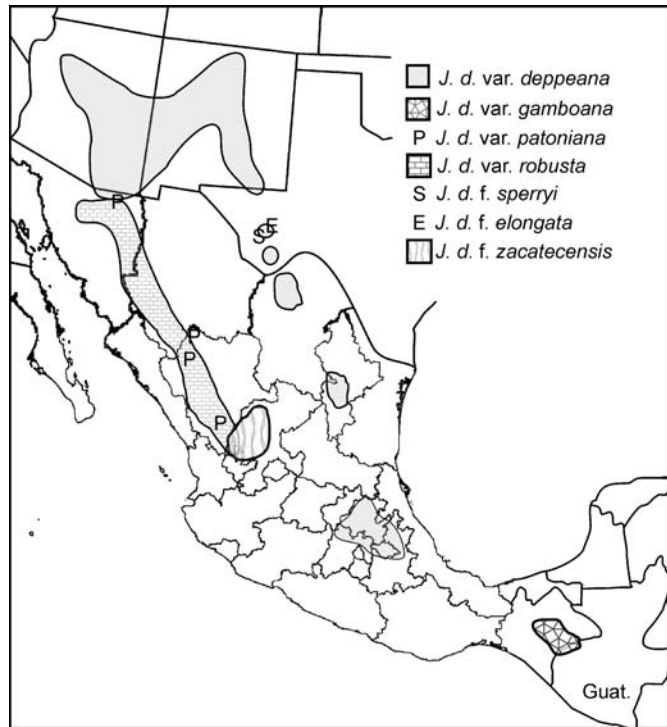


Figure 5.15. Distribution of *Juniperus deppeana* and its varieties and forms. From Adams et al. (2006).

fingerprinting (RAPDs). Figure 5.16 shows PCO based on 97 RAPD bands and indicates a similar pattern to that found in DNA sequencing (cf. Figs. 5.14, 5.16). Notice (Fig. 5.16) that *J. saltillensis* is well resolved and *J. deppeana* is resolved into three groups: *J. deppeana* var. *robusta*, var. *gamboana*, and all other *J. deppeana* varieties.

Removing *J. saltillensis* and reanalysis of the PCO resulted in the separation of var. *gamboana*, var. *robusta*, but var. *patoniana* and f. *zacatecensis* were interspersed with var. *deppeana*

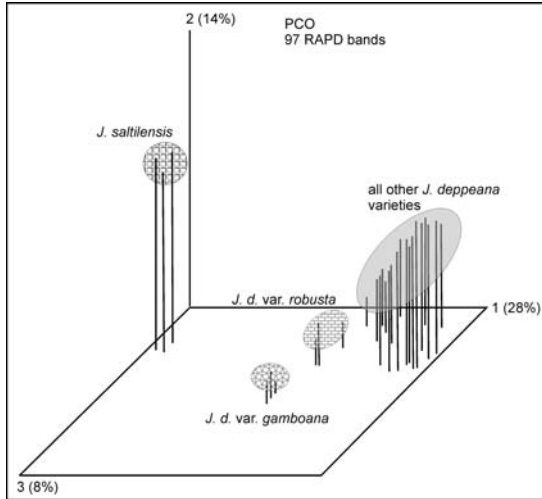


Figure 5.16. PCO, 97 RAPDs of *J. saltillensis* and *J. deppeana* varieties.

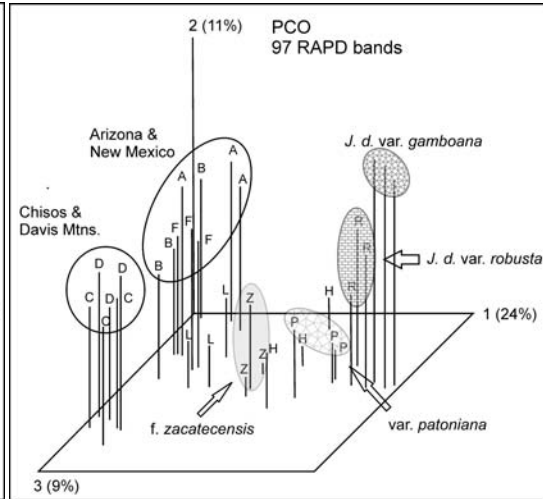


Figure 5.17. PCO, 97 RAPDs of *J. deppeana* varieties. H and L are from El Chico, Natl. Park, Hidalgo and Los Liros, Coah. respectively.



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).

(Fig. 5.17). There is considerable variation in *J. deppeana* and infraspecific variation in *J. deppeana* is still not completely understood (Adams, et al., 2007).

Key to *J. deppeana* varieties and forms:

- 1a. Terminal whips long (15 - 30 cm) and pendulous, all (or nearly all) leaves on adult plants juvenile (decurrent, or whip type).....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
 - 3a. Stem bark longitudinally furrowed into long, interconnected strips, terminal whip branches often flaccid and pendulous.....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*



J. deppeana var. *deppeana*
with quadrangular bark
McKittrick Canyon,
Texas



J. deppeana var. *deppeana*, Davis Mtns., Texas, cf. Adams 4974

Juniperus deppeana Steudel var. ***deppeana***, Nom. Bot. ed. 2, 1:835 (1840). Alligator bark juniper, Cedro, cedro chins (Puebla), sabino, Tascate (Chihuahua and Durango), Tlascal or Tlaxcal (Hidalgo), Huata, Agoziza (Sonora). Type: Mexico, Veracruz, Llanos de Perote, C. J. W. Schiede in 1828 (holotype location unknown or destroyed). lectotype: MO, designated by Zannoni and Adams, Bot. Soc. Mex. 38: 83 (1979).

J. thurifera Spach, Ann. Sci. Nat. Bot., ser. 2, 16: 298 (1841), *non* L. (1753)

J. mexicana Schiede ex Schltld. & Cham., Linnaea 5: 77 (1830), *non* Spreng. (1826)

J. foetida Spach, Hist. Nat. Veg. Phan. 11: 314 (1841)

Sabina mexicana (Schltld. & Cham.) Antoine, Cupress.-Gatt.: 38 (1857)

J. gigantea Roezl, Cat. Grain. Conif. Mexic. 8 (1857)

Sabina gigantea (Roezl) Antoine, Cupress.-Gatt.: 36 (1857)

J. pachyphlaea Torr., US Rep. Expl. Survey Miss. Pacific 4(5): 142 (1857) Thick bark juniper, alligator bark juniper, oak bark juniper, cedros. Type: Zuni Mts., NM, USA, Bigelow in 1853, NY!

Juniperus deppeana Steud. var. *pachyphlaea* (Torr.) Martinez. Anales Inst. Biol. Univ. Nac. Mex. 17(1): 53 (1946).

Sabina pachyphlaea (Torr.) Antoine, Cupress.-Gatt.: 39 (1857)

S. plochyderma Antoine, Cupress.-Gatt.: 40 (1857). [*basion* = *nom nud.* (*J. plochyderma*)]

Dioecious. **Trees** 10-15 (-30) m, with rounded crown. **Trunk bark** exfoliating in rectangular plates. **Branches** erect, often gray green or light green, branchlets (1 cm) exfoliating to reveal copper color. **Leaves** both decurrent (whip) and scale. Decurrent and scale leaf margins denticulate (20 X), whip and scale leaves usually with ruptured glands (clear, yellow or white exudate). **Seed cones** globose, 8-15 mm, fibrous to obscurely woody, maturing in the second year, reddish-tan to dark reddish-brown with glaucous bloom. **Seeds** 2-4 per cone, 6-9 mm long. **Pollen shed** late winter - early spring. **Habitat** rocky soils, slopes and mountains; 2000-2900 m. **Uses** fence posts. Sprouts from cut stumps and is thus a pest in grasslands. **Dist.:** AZ, NM, TX, northern Mexico, see Fig. 5.15. **Status:** common, not threatened.



J. deppeana var.
deppeana
leaves and
seed cones.



United States National Big Tree for *Juniperus deppeana* var. *deppeana* in the Prescott National Forest, AZ. Craig Walton is on the left and David Emerson is on the right. Photo courtesy of Craig Walton.



Habitat of *J. deppeana*, 2580 m in the White Mtns., AZ, with Ponderosa pine. cf. *Adams 10926, 10927.*



Fence posts made from *J. deppeana* in Mexico.

Juniperus deppeana f. *elongata* R. P. Adams. Phytologia 87(2): 100 (2005). Elongated branch deppeana. Type: USA, Texas, Jeff Davis Co., 4.2 km w of entrance to Lawrence E. Wood Madera Ck. park, 1845 m, N 30° 43.437', W104° 08.255', 11 Mar 2005. R. P. Adams 10627 (holotype BAYLU, isotype SRSC) (note: SRSC has been merged with BAYLU).

This form differs from typical *J. deppeana* in having terminal whips long (15 - 30 cm) and pendulous, and all (or nearly all) leaves on adult plants are juvenile (decurent, or whip type). Another plant was found in the Davis Mtns. at Brown Mtn., 2190 (summit), R. P. Adams 10629. It seems this form involves only a few genes.

Dist.: see map above.



J. deppeana f. *elongata*, Davis Mtns.
cf. Adams 10627, holotype.



J. deppeana f. *elongata*, Davis Mtns., Brown Mtn.
cf. Adams 10629, isotype.



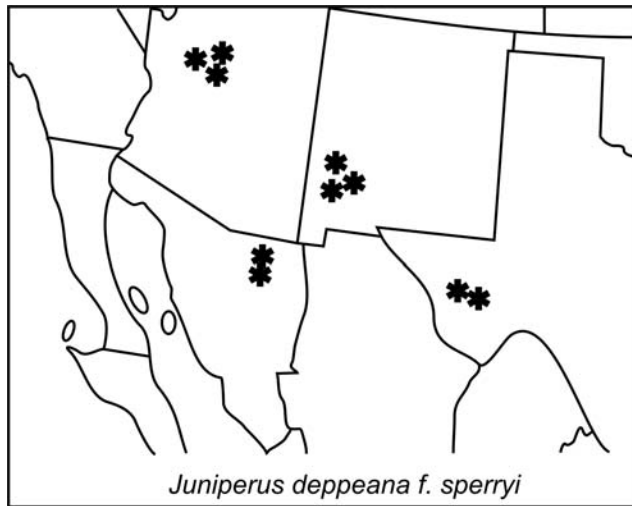
J. deppeana f. *elongata*, bark exfoliating in rectangular plates as is typical of *J. deppeana*. cf. Adams 10627.

Juniperus deppeana Steudel f. *sperryi* (Correll) R. P. Adams. Brittonia 25 (3): 289 (1973). Sperry's juniper. Type: United States: Jeff Davis County: Dry Canyon of Davis Mountains, about 8 mi. (13 km) from Sproul Ranch Headquarters. *Sperry T870* (holotype GH, isotype: US).

J. deppeana Steud. var. *sperryi* Correll, Wrightia 3:188 (1966)

J. deppeana Steud. subsp. *sperryi* (Correll) E. Murray, Kalmia 13:8 (1983)

Dioecious. **Trees** 10-15 m, with rounded crown. **Trunk bark** stem bark longitudinally furrowed into interconnected strips. **Branches** terminal whip branches and larger branches flaccid and pendulous. **Leaves** both decurrent (whip) and scale. Decurrent and scale leaf margins denticulate (20 X). **Seed cones** globose, 8-15 mm, fibrous to obscurely woody, maturing in the second year, reddish-tan when immature, then reddish-blue with very light bloom (glaucous) when mature. **Seeds** 5-6 per cone or 1(2) in Sonora (see discussion below), 6-9 mm long. **Pollen shed** spring. **Habitat** rocky soils, slopes and mountains. **Uses** none known. **Dist.:** Davis Mts., Texas, n. Sonora, Mexico. **Status:** Davis Mts., Gila Natl. Forest, SW NM, Prescott NF, AZ, n. Sonora, MEX.



J. deppeana f. *sperryi* with bark exfoliating in strips.



J. deppeana f. *sperryi* leaves and seed cones.



Andy Allgood with largest known tree of *J. deppeana* f. *sperryi* in Prescott NF, AZ.



J. deppeana f. *sperryi* with the author (1968) at the type tree on the H. E. Sproul Ranch, Ft. Davis, Texas, cf. *Adams* 352



Juniperus deppeana f. *sperryi* tree with furrowed bark (insert photo) in Gila National Forest, NM. Photo by Lew Stockman.

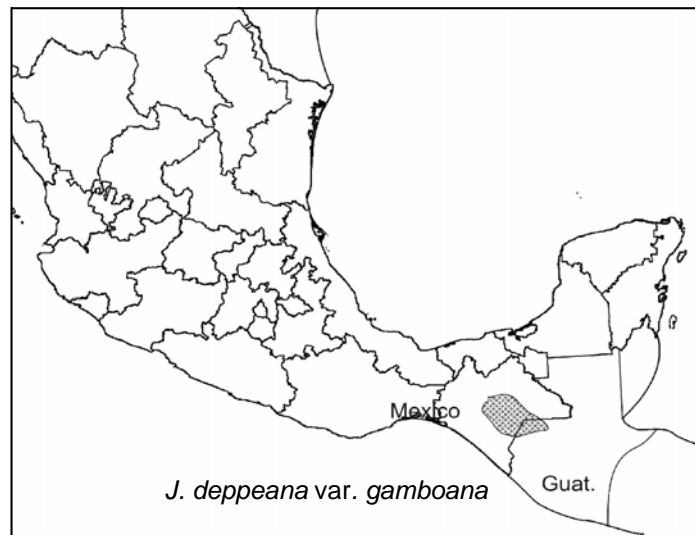
Juniperus deppeana var. *gamboana* (Mart.) R. P. Adams Phytologia 88: 229 (2006) Type: Mexico: Chiapas: near Teopisca, *M. Martinez* 6701 (holotype: MEXU!)

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

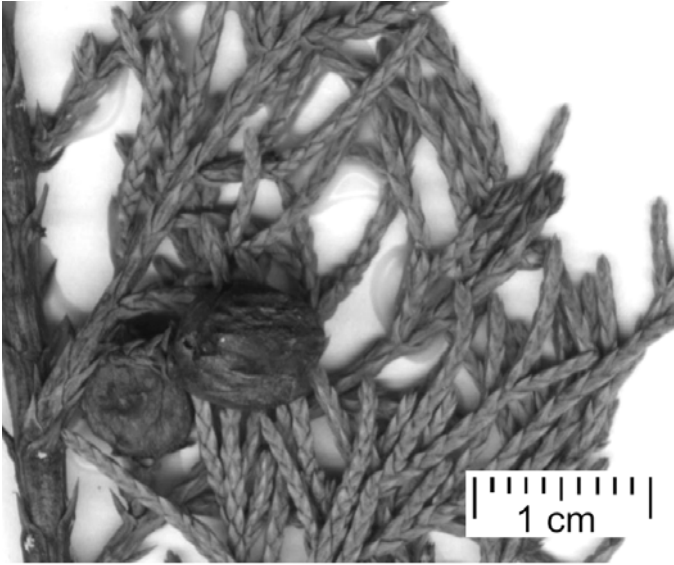
Cedro, cipres, cipres comun, bac'il nuhkupat (Tzeltal at Tenejapa, Chiapas), K'uk',ton, nukul pat (Tzotzil at Zinacantan, Chiapas), gamboa juniper.

Dioecious. **Trees** (to 12 m), stem branching 1 or 2 m above base, crown rounded or very broadly conic. **Trunk bark** reddish-brown to dark gray brown, exfoliating in quadrangular plates. **Branches** ascending to erect, terminal whip branches ascending to erect, with straight tips, angle of branching of ultimate twig 35-45 degrees. **Leaves** decurrent and scale like, scale leaves mostly opposite, ovate to elliptic, 1.5-2 mm long, with acute or obtuse, appressed tips, margin finely-toothed, yellow-green to green. **Seed cones** with soft pulp, globose, reddish-brown, with a light coat of bloom (glaucous), 5-8 mm diameter. **Seeds** 1(or 2) per cone, ovoid, 4-6 mm long, 3-4 mm wide, several large grooves, brown; hilum about two-thirds length of seed. **Pollen shed** spring. **Habitat** on limestone soils in pine-oak pine-oak-juniper forests in the sierras at 1670-2200 m elevation in Chiapas, Mexico; limestone hillsides near San Miguel Acatan at 1920-2134 m elevation in the Sierra de los Cuchumatanes of Depto. Huehuetenango, Guatemala. **Uses** none known. **Dist.:** Mexico-Guatemala border. **Status:** VU, B1+2c. This taxon is narrowly distributed in areas that may be converted to grazing. It is vulnerable.

Recent DNA sequencing has indicated that *J. gamboana* nested well within the *J. deppeana* clade (Fig. 5.14), so it appears that the checkered (quadrangular) bark is a conserved character in this group.



J. deppeana var. *gamboana*
bark exfoliating in rectangular plates.



J. deppeana var. *gamboana*
leaves and seed cones.



J. deppeana var. *gamboana*, Chiapas, Mexico
habitat. cf. *Adams* 6863-6867



J. deppeana var. *gamboana*, Chiapas, Mexico
cf. *Adams* 6863-6867

Juniperus deppeana Steudel var. *patoniana* (Martinez) T. A. Zanoni. Biochem. Syst. & Ecology 4: 152 (1976). Cedros, tascate, sabino. Type: Mexico, Durango, El Salto. *M. Martinez and C.E. Blanco 6710* (holotype: MEXU!).

J. patoniana Martinez, Anal. Inst. Biol. Mexico 17:62, 63 (1946)

J. patoniana f. *obscura* Martinez. Anal. Inst. Biol. Mexico 17:68 (1946)

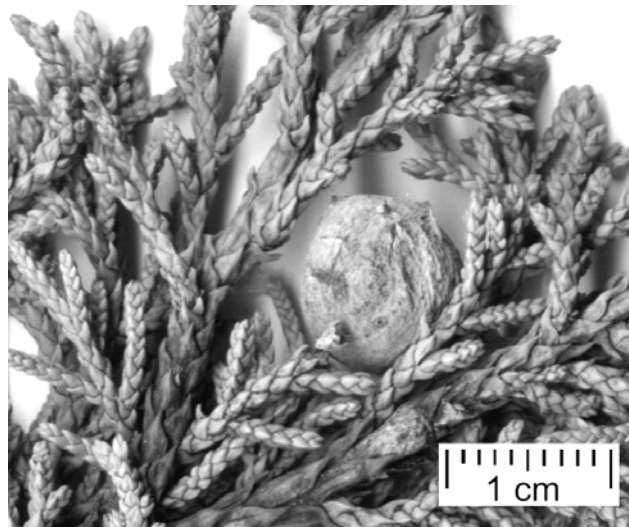
J. deppeana var. *obscura* (Martinez) Gaussen, Trav. Lab. Forest. Toulouse Tome II, Sect. 1. Vol. 1 partie II. Fase. 10.150.152 (1968)

Dioecious. **Trees** to 15 m, very sparsely branched, with very irregular, round crown, crown as wide as tall. **Trunk bark** exfoliating in longitudinal strips (occasionally interconnected). **Branches** erect. **Leaves** both decurrent (whip and scale). Decurrent and scale leaf margins denticulate (20 X), gland on whip leaves usually not ruptured (with white exudate). **Seed cones** globose, 8-15 mm, fibrous to obscurely woody, maturing in the second year, reddish-tan (when immature) turning dark reddish-brown with glaucous bloom. **Seeds** (1-)2 – 3 (-6) per cone. **Pollen shed** early spring. **Habitat** rocky soils. **Uses** fence posts. Sprouts from cut stumps and is thus a pest in grasslands. **Dist.:** Occurs as a single or a few scattered trees in the pine-oak-juniper forests, usually with *Juniperus deppeana* var. *robusta*, at 2400-2800 m elevation in the Sierra Madre Occidental of Durango, Mexico. **Status:** VU, B1+2ce. Uncommon, probably vulnerable.



J. deppeana var. *patoniana*, with bark exfoliating in interlaced strips, Mexico. (photo by T. A. Zanoni)

Fig. 5.20. Distribution of var. *patoniana*



Author with *J. deppeana* var. *patoniana*, (1974), Mexico. cf. *Zanoni 2752* (photo by T. A. Zanoni)

Juniperus deppeana Steudel var. *robusta* Martinez, Anales Inst. Biol. Univ. Nac. Mexico 17(1):47 (1946). Robust juniper, cedros. Type: Mexico, Durango, Pueblo Nuevo, Pino Gordo, Estevez 4502 (holotype: MEXU!)

Dioecious. **Trees** to 25 m, with strong central axis, often with 2 trees arising from a single base. **Trunk bark** exfoliating in square to rectangular plates. **Branches** erect. **Leaves** both decurrent (whip) and scale. Decurrent and scale leaf margins denticulate (20 X), gland on whip leaves usually not ruptured. **Seed cones** globose, 8-15 mm, fibrous to obscurely woody, maturing in the second year, tan when immature, to dark reddish-brown with glaucous bloom when mature. **Seeds** (1-)2 - 3 (-6) per cone, 6-9 mm long. **Pollen shed** early spring. **Habitat** rocky soils, slopes and mountains. **Uses** fence posts. Sprouts from cut stumps and is thus a pest in grasslands. **Dist.:** In the pine, pine-oak, oak, pine-oak-juniper-*Arctostaphylos* forests and occasionally in grassland of the Sierra Madre Occidental at 1500-3200 m elevation from Chihuahua s. to Jalisco, Mexico. **Status:** VU, B1+2ce. Common, but probably threatened due to extensive logging operations.

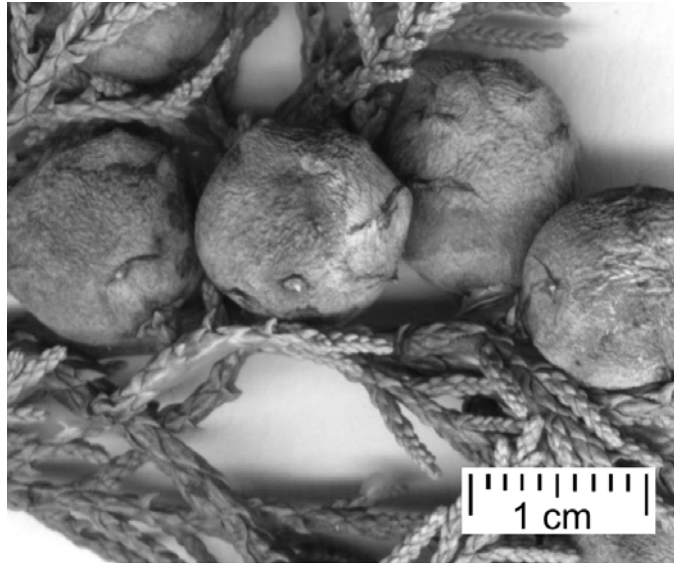


Figure. 5.21 Distribution of *J. deppeana* var. *robusta*.

J. deppeana var. *robusta*, Cerro Huehuento, Durango, Mexico, cf. *Adams 10252*



J. deppeana var. *robusta*,
bark
(photo T. A. Zanoni)



J. deppeana var. *robusta*
leaves and seed cones.

Large (12-15 m) dead tree, Durango, Mexico
showing the 'twin' trunks commonly seen in
J. deppeana var. *robusta*.



J. deppeana var. *robusta*, north of El Salto,
Durango, Mexico
cf. *Adams* 10255-10256

Juniperus deppeana f. *zacatecensis* (Mart.) R. P. Adams, Phytologia 88(3): 229 (2006).

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

Juniperus deppeana Steudel var. *zacatecensis* Martinez, Anales Inst. Biol. Univ. Nac. Mexico 17(1): 57, 58 (1946).

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

Dioecious. **Trees** to 8 m with a round crown or large shrubs. **Trunk bark** exfoliating in square to oblong plates. **Branches** erect. **Leaves** both decurrent (whip) and scale. Decurrent and scale leaf margins denticulate (20 X), gland on whip leaves usually not ruptured (with white exudate). **Seed cones** globose, 13-20 mm diam. with heavy bloom on cones, causing cone to appear white, reddish-brown beneath bloom. **Seeds** 1-4(-7) per cone. **Pollen shed** fall. **Habitat** rocky areas and grasslands. **Uses** fence posts. Sprouts from cut stumps and is thus a pest in grasslands. **Dist.:** In oak-pine-juniper and pinyon-juniper woodlands, and on grasslands on hills at 1980-2470 m elevation, in w. Zacatecas and adjacent Durango, Mexico. **Status:** VU, B1+2ce. This taxon is known from a limited area and is likely vulnerable due to land clearing.



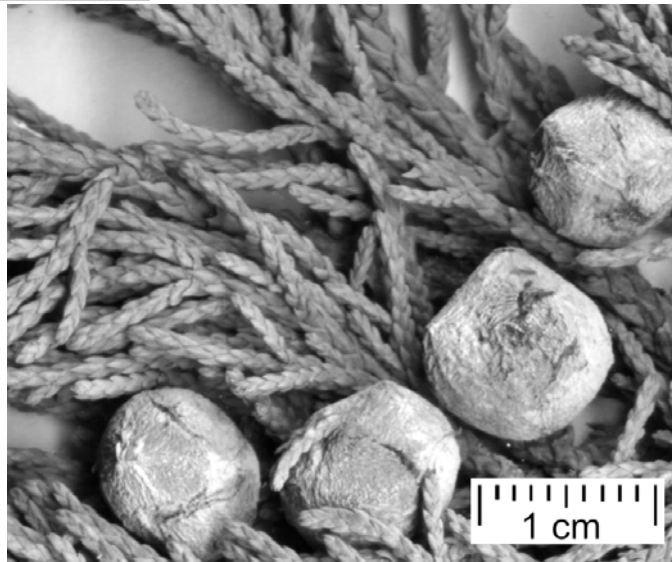
J. deppeana f. *zacatecensis* bark

Figure 5.22. Distribution of *J. d. f. zacatecensis*.

Juniperus deppeana
f. *zacatecensis*

leaves and seed cones.

Notice the copious amounts of waxy bloom on seed cones.





J. deppeana f. *zacatecensis*, notice white bloom on seed cones.

J. deppeana f. *zacatacensis*, 18 km W. of Sombrette, Mexico, cf. *Adams 6840-6844*



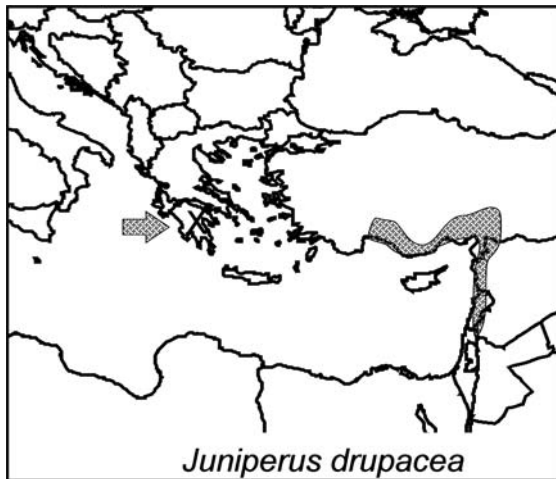
J. deppeana f. *zacatacensis*, habitat, Mexico, cf. *Adams 6840-6844*

Juniperus drupacea Labill., Icon. Pl. Syriae 2: 4, t.8 (1791). Syrian juniper, drupe-like fruited juniper, Type: Turkey, Hatay, Jebel Akra, *J. J. H. de la Labillardiere s. n.* (holotype G-DEL?, n.v.; isotypes FI, K)

Arceuthos drupacea (Labill.) Antoine & Kotschy, Oesterr. Bot. Wochenbl. 4(31): 249 (1854).

Dioecious. **Trees** up to 15 m, with a broad pyramidal crown (but assuming a columnar habit under cultivation). **Trunk bark** brown, cinnamon beneath, exfoliating in narrow strips. **Branches** erect. **Leaves** acicular, 10-25 x -4 mm, linear-lanceolate, acuminate, patent, with two white bands above. **Seed cones** 20-25 mm, ripening in the second year, sub-globose, brownish-purple or bluish-black, pruinose, glaucous. **Seeds** 3 per cone, united to form a single large stone. **Pollen shed** fall. **Habitat** rocky areas. **Uses** none known. **Dist.:** S. Greece (N. end of Parnon Oros, Arkadhia), Asia Minor and Syria. **Status:** common in areas, but it may become threatened.

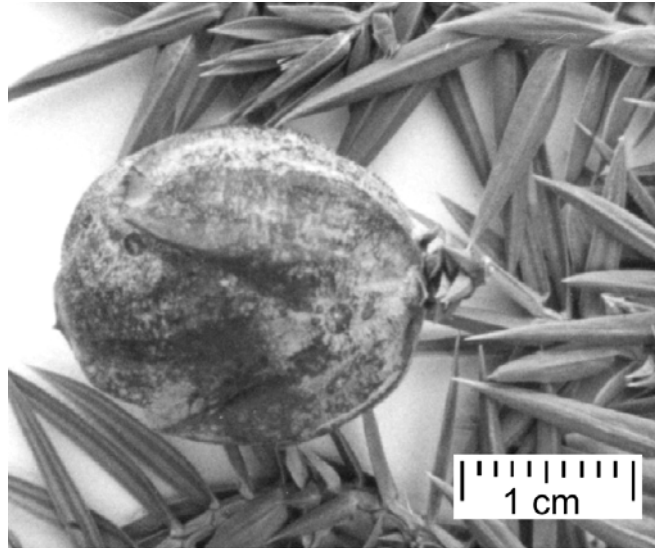
This species in the monotypic section, *Caryocedrus*, is thought to be the most primitive of the junipers (see Fig. 1.5, Chpt. 1).



J. drupacea
bark



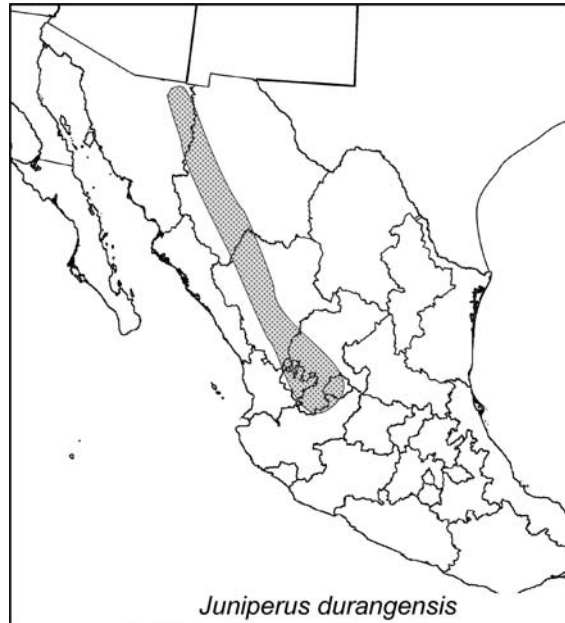
J. drupacea, 15 m tall tree, e. of Tripolis
Greece, cf. *Adams* 8795-8796



Seed cone and leaves of *J. drupacea*.

Juniperus durangensis Martinez, Anales Inst. Biol. Univ. Nac. Mexico 17(1): 94-95 (1946). Cedro, tascate, Durango juniper. Type: Mexico, Durango, Puerto de Santo Domingo, 30 km. from El Salto, *M. Martinez* 7015 (holotype: MEXU!).

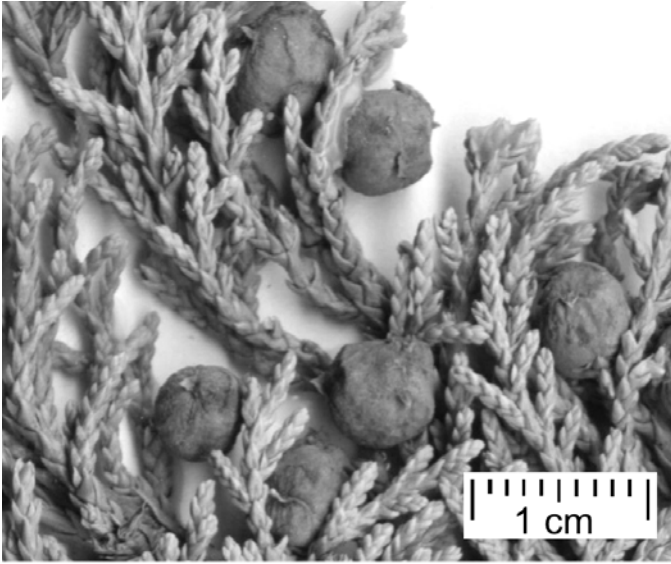
Dioecious. **Trees** shrub to small tree (to 5 m), usually branching near base, trees have irregular crowns. **Trunk bark** thick ashy-brown, long fibrous strips or scales. **Branches** terminal whips recurved so the final 2-4 cm appears as hooks, ascending-erect to strict, spreading in trees, angle of branching of ultimate twig about 60 degrees. **Leaves** scale leaves mostly opposite on ultimate twigs, on ultimate twig appear like a chain of beads, 1 - 2 mm long, margins finely toothed, dark gray-green. **Seed cones** very glaucous, bluish-reddish, with soft pulp, gibbous, 6-7 mm long, 4-6 mm wide. **Seeds** 1-3 (-4) per cone, subconic to oval, acuminate or obtuse, 3-4 mm long, 2-3 mm wide, dark reddish-brown with shallow grooves; hilum to one-half length of seed. **Pollen shed** Jan. – March. **Habitat** Rhyolite rocks and in openings in pine-oak or pine-oak-juniper-Arctostaphylos forests at 1600-2900 m elevation. **Uses** none known. **Dist.:** Sonora, Chihuahua, Durango, extreme w. and s Zacatecas, n. Jalisco and Aguascalientes, Mexico. **Status:** VU,B1+2c. This taxon is found on unusual Rhyolite rocks. It is not common, but probably not threatened at present.



J. durangensis,
bark

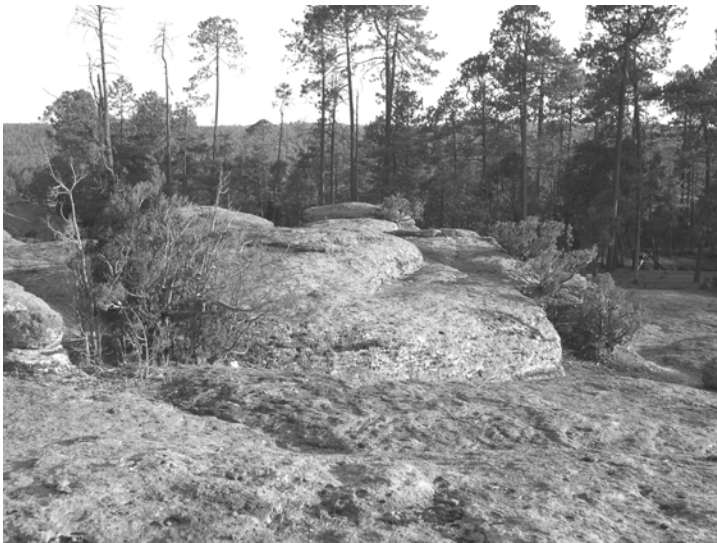
Juniperus durangensis
showing the curved or 'hooked'
ends of branchlets that are
characteristic of the species.





J. durangensis
leaves and seed cones.
Notice the scale leaves appear
as a 'chain of beads'.

J. durangensis on Rhyolite rocks,
La Ciudad, Durango, Mexico,
cf. *Adams 10253, 10254.*



J. durangensis, habitat on
Rhyolite with *Pinus* in
background.
cf. *Adams 10253, 10254*

Juniperus erectopatens (Cheng and L. K. Fu) R. P. Adams, *Biochem. Syst. Ecol.* 27: 723 (1999). Song pan yuan bai (Songpan juniper). Type: China, Sichuan, Songpan, 2700m, T. T. Yu 2702 (holotype PE!)

Sabina vulgaris Antoine var. *erectopatens* Cheng and L.K. Fu. *Acta Phytotax. Sin.* 3(4):86(1975).

Juniperus sabina L. var. *erectopatens* (Cheng and L.K. Fu) Y.F. Yu and L. K. Fu, *Novon* 7: 444 (1997).

Juniperus chinensis L. var. *chinensis* in Farjon (2005).

Dioecious rarely monoecious. Small **Trees** to 4 m. **Trunk bark** grayish brown exfoliating strips. **Branches** branchlets densely arranged, ascending, slender, 0.8-11 mm in diam. **Leaves** both scale-like and decurrent; decurrent leaves usually present on young plants, rarely present on adult plants, decussate or in whorls of 3, closely appressed, 3-7 mm, concave adaxially, convex abaxially, apex sharply pointed; scale like leaves decussate, rhombic or rhombic-ovate, 1-2.5 mm, abaxial gland central, prominent, elliptic. **Seed cones** light brownish green when immature, purplish blue to black when mature, often glaucous, usually irregularly globose, (3-) 4-5 mm, (1-) 2-seeded. **Seeds** ovoid, slightly flattened, 4-5 mm, ridge, with resin pits, apex blunt or slightly pointed. **Pollen shed** summer. **Habitat** on rocky slopes around Songpan, Sichuan. **Uses** none known. **Dist.:** around Songpan, Sichuan, China. **Status:** distribution and abundance is not known, so it should be considered threatened at present.

DNA sequencing (Schwarzbach et al., in prep.) has shown (Fig. 1.4) that *J. erectopatens* is one of the most distinct species of *Juniperus*. Sequence data is in concordance with oil and RAPDs data (Figs. 3.6 and 3.7, Chpt.3) showing that *J. erectopatens* is not conspecific with *J. chinensis* as previously thought (Farjon, 2001, 2005). I collected it at the edge of a field south of Songpan, Sichuan, China. Its distribution is not fully known at present.



J. erectopatens, bark



J. erectopatens, habitat, near Songpan, Sichuan, China
cf. *Adams 8532-8534*



J. erectopatens
leaves and seed cones.



J. erectopatens, Songpan, Sichuan, China, cf. *Adams* 8532-8534

Juniperus excelsa M.-Bieb., Beschr. Land. Terek & Kur, Bot. Anhang: 204 (1800). Grecian juniper. Type: Ukraine, Crimea, Krymskiye Gory, *P. S. Pallas [ex herb. Pallas] s. n.* (lectotype LE! see Imkhanitskaya, 1990).

J. lycia Pall, Fl. Ross. 1(2): 14, t. 56 (1789), *non* L. (1753)

J. sabina L. var. *taurica* Pall., Fl. Ross. 2:15 (1789)

J. sabina L. var. *excelsa* (M.-Bieb.) Georgi, Beschreib. Russ. Reiches 3(5):1358 (1800)

J. foetida Spach var. *excelsa* (M.-Bieb) Spach (proparte, sine syn. = *J. occidentalis* (Hook.) Ann. Sci. Nat. Bot. ser.2, 16:297 (1841)

J. isophyllos K. Koch, Linnæa 22: 304 (1849)

J. olivieri Carriere, Traite Gen. Conif.: 57 (1855)

Sabina excelsa (M.-Bieb.) Ant., Cupress.-Gatt.:45, t. 60 (1857)

Sabina religiosa Antoine, Cupress.-Gatt.:47, t.61 (1857)

Sabina isophyllos (K.Koch)Ant., Cupress.-Gatt.:48, tt. 64-66 (1857)

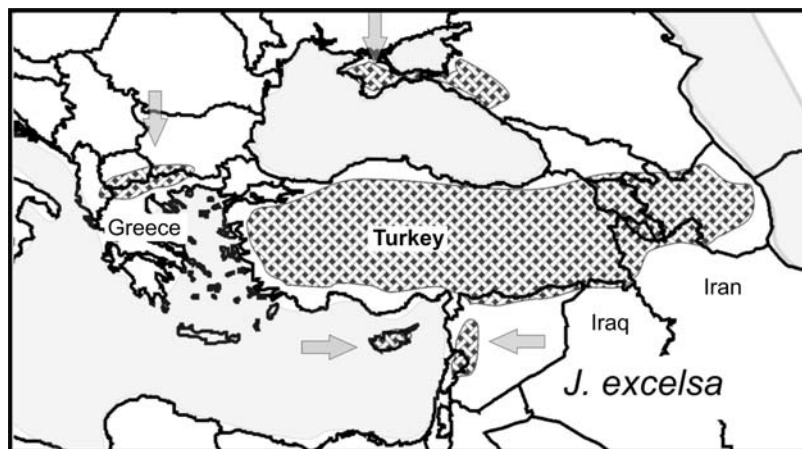
Sabina oliviera (Carriere) Antoine, Cupress.-Gatt.70 (1857)

J. aegaea Griseb., Veg. Erde: 378, 572 (1871)

J. taurica (Pall.) Lipsky (no. Lindl.,1850) in O. E. Knorring & Z. A. Minkvich, Rastit. Aulie-Atinsk. u. s. Dar'inskoi obl./Travaux d'expedition pur exploration des regions de Colonization Russe d'Asie; 2. Explor. bot. 1909, 6: 185-186. pl. (1912)

J. excelsa M. -Bieb. subsp. *excelsa* var. *depressa* O. Schwarz, Fedde's Repert. Spec. Nov. Regni Veg. 36(1): 66 (1934)

Monoecious or Dioecious. Trees up to 20 m, with a conical crown when young, later broad and open. **Trunk bark** light brown, exfoliating in narrow strips. **Branches** twigs 0.6-0.8 mm in diameter, terete, scaly. **Leaves** scale and decurrent (juvenile), decurrent leaves 5-6 mm, only on juvenile growth; scale-like leaves 1-1.5 mm, ovate-rhombic, closely appressed, acute, with a central, ovate or linear gland on the back, entire, the border not scarious. **Seed cones** 8 mm, ripening in the second year, globose, slightly glaucous, dark purplish-brown when ripe. **Seeds** 4 - 6 per seed cone, free. **Pollen shed** spring. **Habitat** rocky areas. **Uses** none known. **Dist.:** Albania, Arabian Peninsula, Bulgaria (S). Greece (N), Lebanon, Iran, Turkey, Caucasus Mtns., Yugoslavia, 300 m to 1000 m in Crimea, up to 3400 m in Iran. **Status:** abundant in parts of its range so it is not threatened.



J. excelsa, bark



Juniperus excelsa
leaves and seed cones.



J. excelsa, 8 km w of Lemos, Greece,
cf. *Adams* 8787, 8788



J. excelsa, 30 km n. of Eskisehir, Turkey
cf. *Adams* 9430-9432