

## Taxonomy of the turbinate shaped seed cone taxa of *Juniperus*, section *Sabina*: Revisited

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### ABSTRACT

The recent classification of *Juniperus microsperma* (Cheng & L. K. Fu) R. P. Adams as a member of the multi-seeded, smooth-leaved junipers in section *Sabina* (Adams and Schwarzbach, 2013), necessitates a correction in the turbinate seed cone taxa of *Juniperus*, section *Sabina*. The specimen previously identified as *J. microsperma* from Sichuan (Adams 8522-8524), appears to be a variant of *J. saltuaria* with small seed cones.

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**KEY WORDS:** Taxonomy, *Juniperus*, section *Sabina*, turbinate seed cones, nrDNA, petN-psbM, trnS-trnG, trnD-trnT, trnL-trnF, *J. microsperma*.

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Previously, we (Adams and Schwarzbach, 2012) reported on the taxonomy of the turbinate shaped seed cone junipers of section *Sabina*. This section has been shown to be a distinct clade (Mao et al., 2010; Adams 2011), having seed cones with elongated, pointed tips. In the previous study, a sample (Adams 8522-8524, near Zhe Gu Mtn., Maerkan County, Sichuan, China) with small seed cones thought to be *J. microsperma* (Cheng & L. K. Fu) R. P. Adams was included in the turbinate-coned junipers (Adams and Schwarzbach, 2012). However, recently, we received a specimen of *J. microsperma* from near the type locality: Song Zong, Xizang (Tibet), China, *Jian-Quan Liu QTP-2011-201*. This material proved to be quite similar to the type and is clearly most closely related to *J. erectopatens* (Cheng & L. K. Fu) R. P. Adams as determined by molecular data (Adams and Schwarzbach, 2013).

The purpose of the report is to clarify the taxonomy of the turbinate seed cone taxa of *Juniperus*, section *sabina*; in particular the placement of the mis-identified '*J. microsperma*' from Sichuan.

### MATERIALS AND METHODS

See Adams and Schwarzbach (2012).

### RESULTS AND DISCUSSION

The corrected Bayesian tree for the turbinate seed cone taxa of *Juniperus*, sect. *Sabina* using the nomenclature of Adams and Schwarzbach (2012) is shown in Figure 1. The tree is unchanged except for the changing of the label '*J. microsperma*' to '*saltuaria* Sichuan' (Fig. 1).

A revised minimum spanning network based on 225 mutational events (MEs) is shown in Figure 1, with the nomenclature of Adams and Schwarzbach (2012).

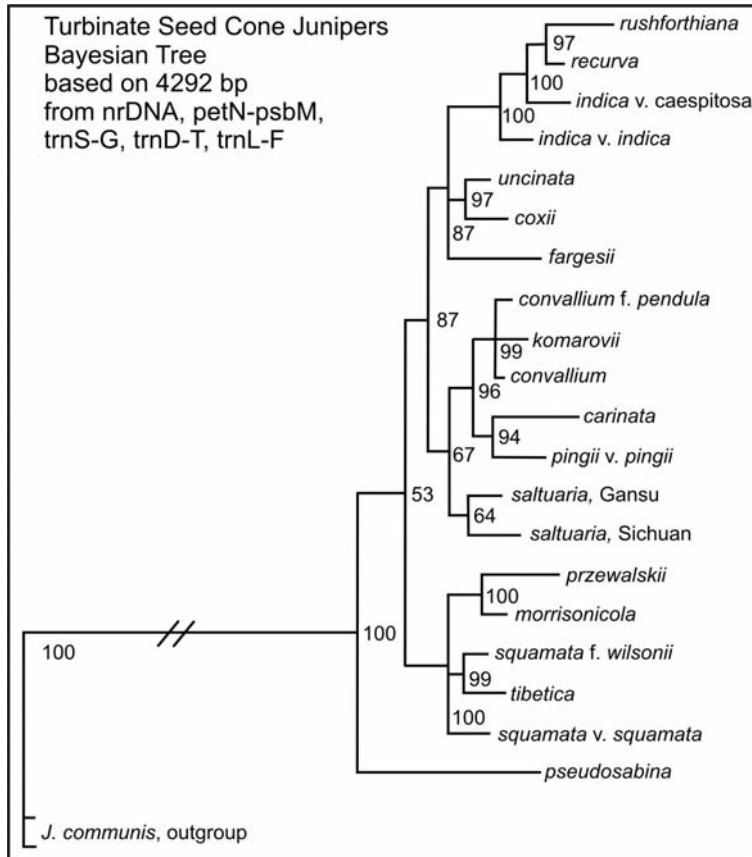


Figure 1. Corrected Bayesian tree for the turbinate seed cone taxa, sect. *Sabina*. Numbers at the branch points are posterior probabilities (as percent). Nomenclature follows Adams and Schwarzbach (2012).

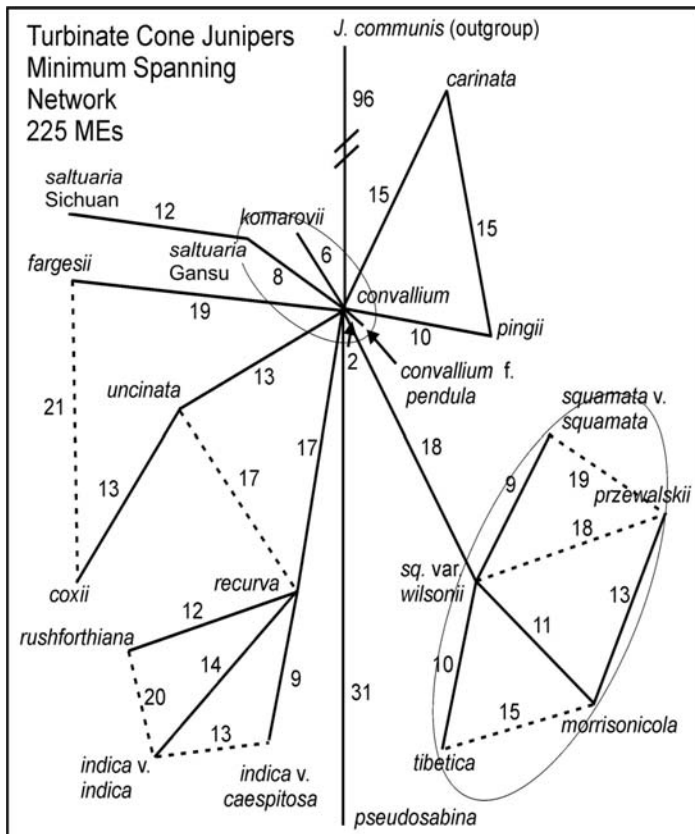


Figure 2. Corrected minimum spanning network based on 225 MEs. Numbers at branch points are the number of mutational events (MEs). Nomenclature follows Adams and Schwarzbach (2012).

A summary of the previous nomenclature and currently supported nomenclature in this section is presented in Table 1.

Table 1. Comparison of Adams and Farjon taxonomic treatments of taxa in this study. Taxa with DNA sequencing support for a modified taxonomic status are in bold.

Adams(2011)	Farjon (2005, 2010)	Supported in Adams and Schwarzbach (2012) and used in this paper
<i>J. convallium</i>	<i>J. convallium</i>	<i>J. convallium</i>
<i>J. coxii</i>	<i>J. recurva</i> v. <i>coxii</i>	<i>J. coxii</i>
<i>J. indica</i>	<i>J. indica</i>	<i>J. indica</i>
<i>J. i. var. caespitosa</i>	<i>J. i. var. caespitosa</i>	<i>J. indica</i> var. <i>caespitosa</i> ?
<i>J. i var. rushforthiana</i>	<i>J. indica</i>	<b><i>J. rushforthiana</i></b>
<i>J. komarovii</i>	<i>J. komarovii</i>	<i>J. komarovii</i>
<i>J. morrisonicola</i>	<i>J. squamata</i>	<i>J. morrisonicola</i>
<i>J. pingii</i>	<i>J. pingii</i>	<i>J. pingii</i>
<i>J. p. var. carinata</i>	<i>J. p. var. wilsonii</i>	<b><i>J. carinata</i></b>
<i>J. przewalskii</i>	<i>J. przewalskii</i>	<i>J. przewalskii</i>
<i>J. p. f. pendula</i>	<i>J. przewalskii</i>	<b><i>J. convallium</i> f. <i>pendula</i></b>
<i>J. pseudosabina</i>	<i>J. pseudosabina</i>	<i>J. pseudosabina</i>
<i>J. recurva</i>	<i>J. recurva</i>	<i>J. recurva</i>
<i>J. r. var. uncinata</i>	<i>J. recurva</i> ?	<b><i>J. uncinata</i></b>
<i>J. saltuaria</i>	<i>J. saltuaria</i>	<i>J. saltuaria</i>
<i>J. squamata</i>	<i>J. squamata</i>	<i>J. squamata</i>
<i>J. s. var. fargesii</i>	<i>J. squamata</i>	<b><i>J. fargesii</i></b>
<i>J. s. f. wilsonii</i>	<i>J. pingii</i> f. <i>wilsonii</i>	<b><i>J. s. var. wilsonii</i></b>
<i>J. tibetica</i>	<i>J. tibetica</i>	<i>J. tibetica</i>

There are unresolved taxonomic problems in *J. squamata*, *J. squamata* var. *wilsonii*, *J. fargesii*, and other specimens with decurrent leaves. The problems are under additional study.

#### ACKNOWLEDGEMENTS

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